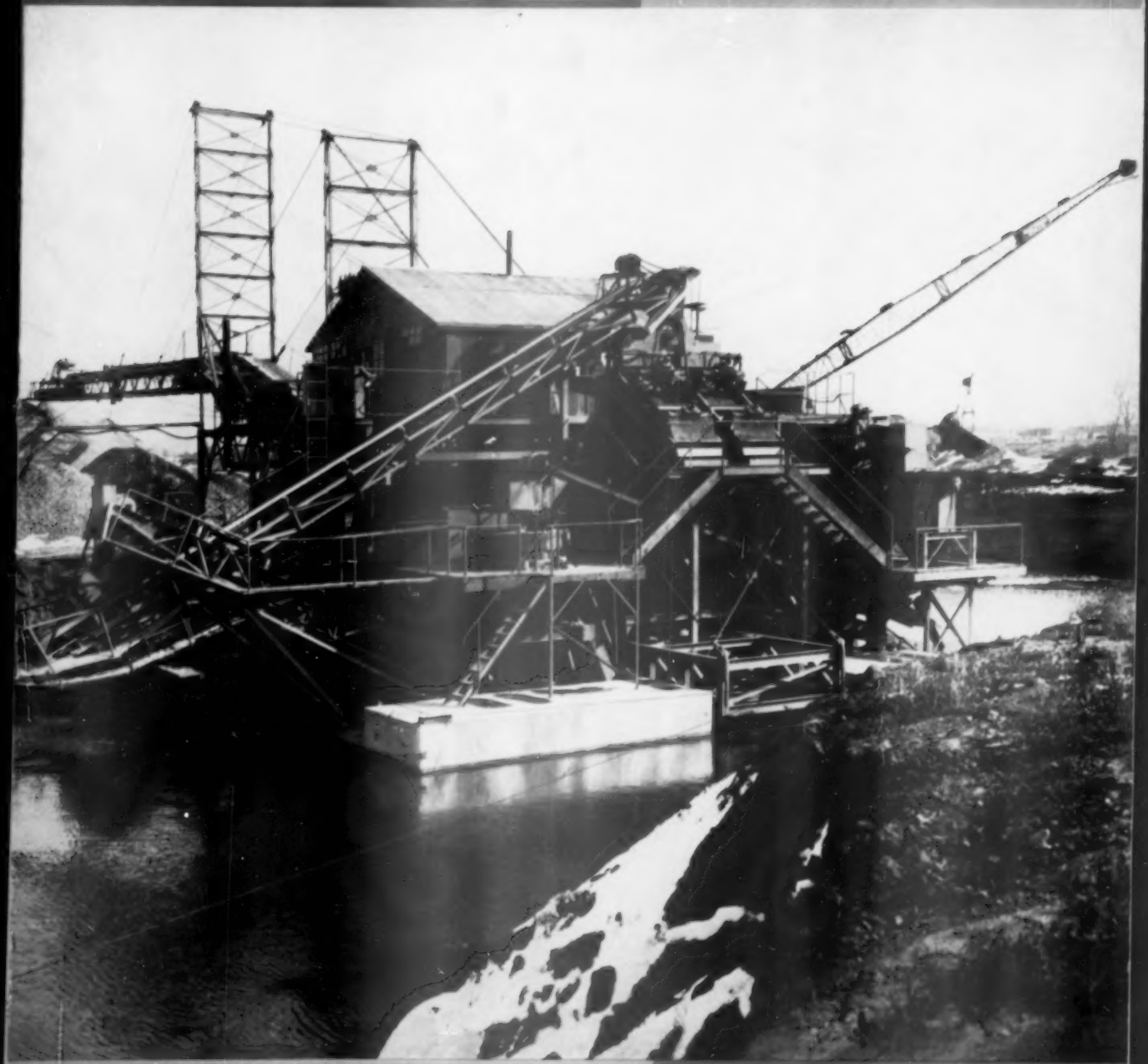
THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD



Large capacity dredge operated by Cooley Gravel Co., south of Denver, Colo.

FEBRUARY 1956

ACID TEST!

"These CAT* Engines take it in stride"

"If you want to give an engine the acid test," says Frank Muren, superintendent of this road job in the Mojave Desert, "put it in a hot plant like ours. There's heat and plenty of dust, but these Cat Engines take it in stride."

There are three Caterpillar D17000 Engines in this hot plant at Edwards Air Force Base, Calif., with more than 14,000 hours among them—and *no repairs*. One of them is shown here powering the dryer, together with a Cat D318 supplying auxiliary power. The contractors, Fredericksen and Kasler of Sacramento, Calif., have seven Caterpillar Engines on the job with a total of about 25,000 hours.

Cat Diesels owe their trouble-free work lives to such features as "Hi-Electro" hardened crankshaft journals, long-lasting aluminum alloy bearings, and highly *effective* filters and seals that keep lubricants *in* and harmful grit *out*.

It's *economical* work life, too. Every Cat Diesel is built to operate cleanly and efficiently even on low-cost fuels, such as No. 2 furnace oil. The rugged simplicity of these efficient power units means easy maintenance, minimum down time, low repair bills.

There's a Caterpillar Engine or Electric Set for *your* job requirements, to 520 HP and 315 KW. Your Caterpillar Dealer will gladly help you select the equipment that will do more work for you at lower cost. See him soon—you can count on him whenever you need fast, reliable service or original Cat parts.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

MODERN HEAVY-DUTY POWER

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Now they cut through rock with fire

A typical example of B. F. Goodrich improvement in rubber

THE white flame shooting out of the metal pipe is 3800 degrees hot. So hot that it eats through 25 feet of solid granite in *an hour*—something that used to take two men with drills all day long. The spitting fire is made right there in the pipe—a mixture of oxygen and fuel oil fed to the pipe through rubber hose.

The equipment maker wanted a hose that wouldn't go to pieces in a few days from the pressure, oil and heat. His men talked it over with B. F. Goodrich and learned that engineers had developed a hose for just such jobs.

They found a way of reinforcing the hose with strong cords that stand over 5 times the pressure needed to shoot the flame—protecting the man who does the work. They developed a special rubber for the inside that stands oil without rotting or weakening.

The B. F. Goodrich hose that carries the oxygen, fuel oil, and cooling water to the jet pipe had been on the job *8 months* when the picture was taken, is still going strong.

This is an example of the ways B. F. Goodrich engineers find to make rubber save money for users—either by doing a job other rubber can't do, or by lasting longer, or by replacing other more expensive materials. Your B. F. Goodrich distributor would like to tell you what these improvements are, and how they can be employed for your profit. *The B. F. Goodrich Company, Dept. M-553, Akron 18, Ohio.*

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ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY — LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD

February 1956

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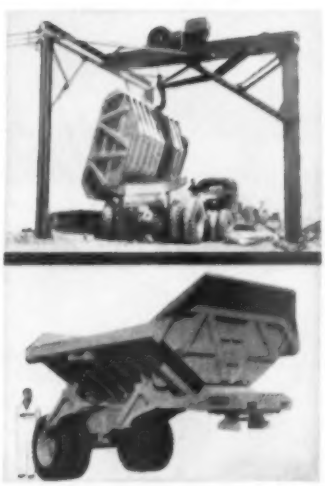
To Subscribers — Date on wrapper indicates issue with which your subscription expires . . . In writing to have address changed, give old as well as new address.

The following notes are quoted by permission from an actual letter written by one quarry operator to another . . .

My boss thinks you should read this...



MY BOSS *is a very fair man. He has end dump trucks and side dump trailers and uses both on jobs for which they are suited. But, when another quarry man asked us what we find best for* straight quarry work, *here's what my boss dictated:*

"**BOTH TYPES** of trucks are required to meet our operational requirements. Were ours a straight quarrying operation, we undoubtedly would favor the side dump trailer units for the following reasons:

"1—Side dump trailer units carry greater pay loads using the same truck as a tractor that is used with the end dump bodies (side dump unit capacity, 35 tons,—end dump unit capacity, 22 tons).

"2—Less spillage experienced hauling 35 tons with side dump units than 22 tons with end dump units (attributed to backs on the side dump trailer units).

"3—Shovel operators claim that loading the side dump units is easier.

"4—Though our roads are maintained for the very best of haulage conditions, racking of loads could be a problem, and in this instance longer unit chassis life should be experienced in the trailer type haulage unit through the better load distribution and the trailer universal action at the tractor hitch.

"5—Dumping at the crusher takes about the same time for both units. The side dump units are dumped by a push-button controlled electric overhead hoist, operated by an attendant at the crusher."

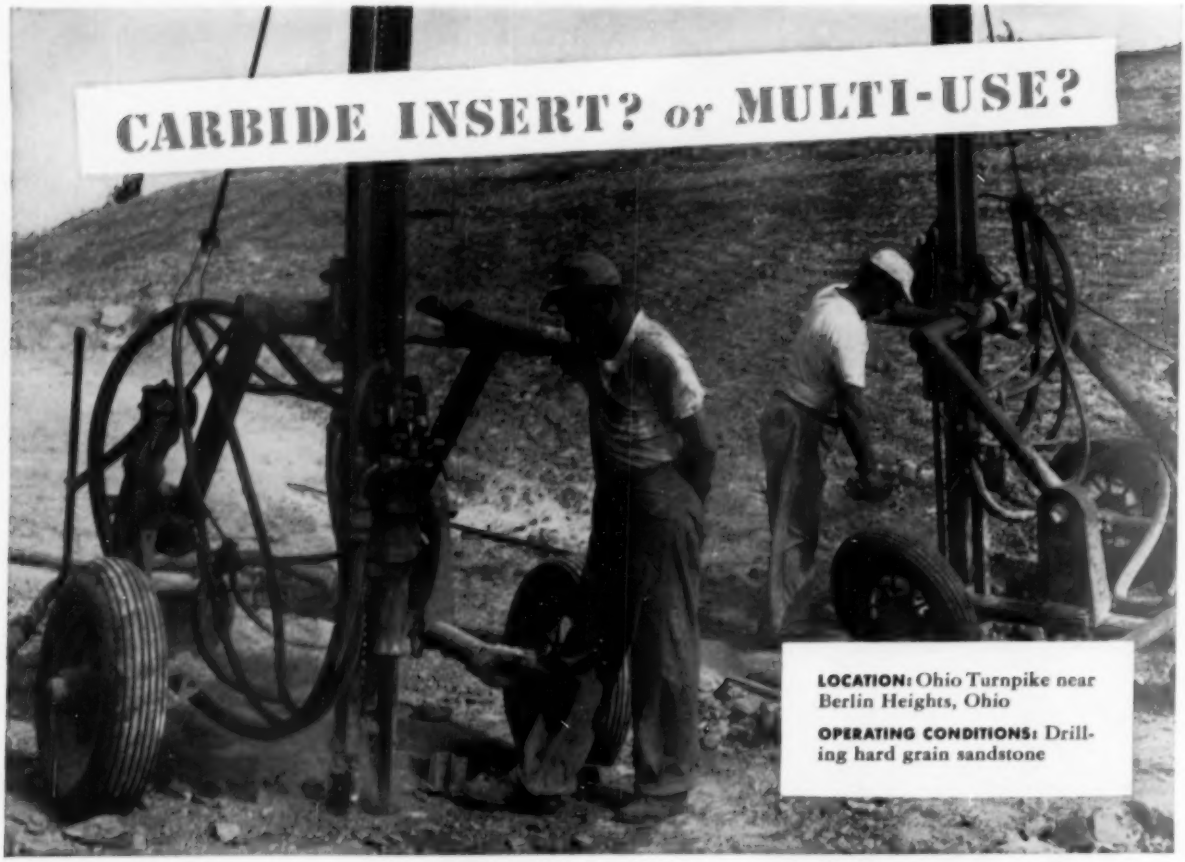
YOU CAN'T BEAT THIS COMBINATION

. . . exclusive EASTON electric overhead dumping system and EASTON doorless pan trailer. EASTON trailer capacities range from 10 to 36 tons. For exceptional grades the EASTON pan body may be truck-mounted.

EASTON®

EASTON CAR & CONSTRUCTION COMPANY • EASTON, PA.

A good haulage system must provide efficient dumping. For the most efficient system you can own get the advantages of EASTON's exclusive background of experience and the EASTON automatic electric overhead hoist. 2-1071



Switch to TIMKEN® multi-use bits helps lower cost of drilling sandstone on Ohio Turnpike for H. N. Rodgers & Sons Company

WHEN H. N. Rodgers & Sons Company started drilling 230,000 yards of sandstone on the Ohio Turnpike near Berlin Heights, Ohio, they found their costs were running too high. After analyzing their technique, they made some changes. One was a switch to Timken® multi-use bits. Now costs are down. And Timken multi-use bits have been used ever since.

Timken multi-use bits usually give best results when you drill ordinary ground. With correct and controlled reconditioning, they give the lowest cost per foot of hole when full increments of steel can be used.

But they may not be the best answer for *all* your drilling problems!

When ground is hard or abrasive, Timken carbide insert bits drill faster and more economically. They're your best bit for constant-gauge holes, small diameter blast holes and extremely deep holes.

Timken multi-use and carbide insert bits also save time when your drillers change bits. They're interchangeable in the same thread series. And dozens of different Timken bits fit the same drill steel.

Both Timken multi-use and carbide insert bits are made from electric furnace Timken fine alloy steel. Both have special shoulder unions that protect threads from drilling impact.

To find out which type bit will cut costs most on your job, call on the Timken Rock Bit Engineering Service. Write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

your best bet for the best bit ... for every job

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

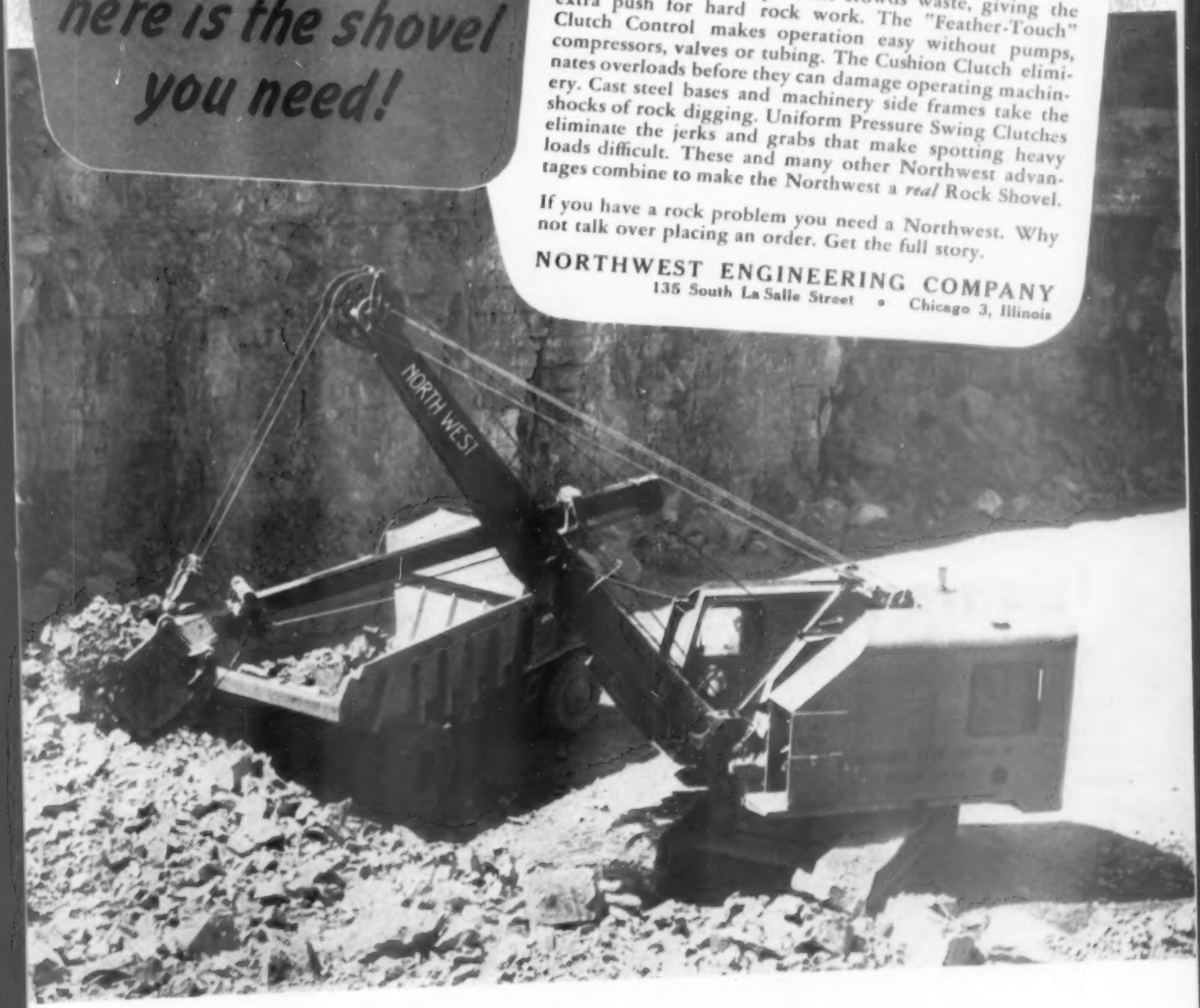
If your business is ROCK- here is the shovel you need!

HERE is another Model 41 Shovel in quarry work. This machine is in the pit of the Alexander Stone Co., Inc. at Marion, Ky. Remember the Model 41 Northwest is a real 1 yd. — built as a 1 yd. from the ground up for 1 yd. service and capable of the output and digging ability you expect from a 1 yd. machine.

Northwests have the stamina for mining operations like this. The Northwest Dual Independent Crowd utilizes force most other independent crowds waste, giving the extra push for hard rock work. The "Feather-Touch" Clutch Control makes operation easy without pumps, compressors, valves or tubing. The Cushion Clutch eliminates overloads before they can damage operating machinery. Cast steel bases and machinery side frames take the shocks of rock digging. Uniform Pressure Swing Clutches eliminate the jerks and grabs that make spotting heavy loads difficult. These and many other Northwest advantages combine to make the Northwest a *real* Rock Shovel.

If you have a rock problem you need a Northwest. Why not talk over placing an order. Get the full story.

NORTHWEST ENGINEERING COMPANY
135 South La Salle Street • Chicago 3, Illinois



NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

Convertible for any Mining Material Handling or Excavation Problem

It's new! Gardner-Denver "Air Trac"® Drill
a self-propelled drilling rig with heavy-duty drill

The Economical Answer to Deep Hole Percussion Drilling in Pits, Quarries and Surface Rock Cuts

Spots accurate holes . . . drills fast . . . on steep hillsides or rough or rocky ground.

Air Trac crawlers have full-traction shoes — each track self-propelled through double-chain drive by its own Gardner-Denver high-torque, five-cylinder radial air motor.

Self-equalizing, self-stabilizing column arm supports Gardner-Denver chain feed drilling mast. Rugged chain feed powered by a high-torque, five-cylinder radial air motor.

Two Air Trac models — one equipped with powerful DH123 (4½") drill — one with the smaller DH99 (4") drill. Furnished with high-quality Gardner-Denver Ring Seal Shanks and Gardner-Denver Sectional Drill Rod equipment for efficient, low-cost deep hole drilling. Send for full specifications.

GARDNER-DENVER

GARDNER-DENVER Since 1859 K KELLER TOOLS

"AIR TRAC" Patent Pending

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
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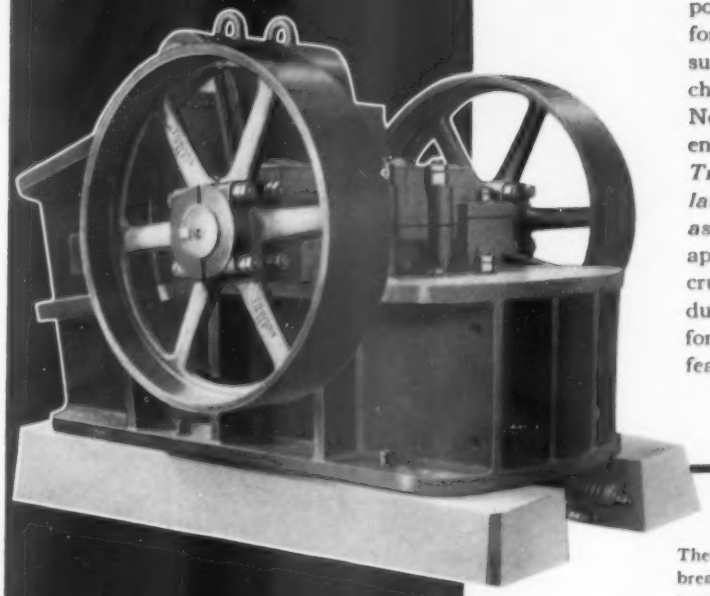
Traylor JAW CRUSHERS

FOR HIGHER TONNAGE OF BETTER PRODUCT AT LOWER PRODUCTION COSTS



Check with the leading rock producers and chances are you'll find their profits start at a Traylor Jaw Crusher. For over half a century Traylor has been designing and building heavy-duty primary crushers that assure quarry-men greater hourly production, lower maintenance expense and reduced power costs. Traylor original non-chokable curved jaw plates apply power more efficiently as a direct crushing force. The increased capacity of each successive feeding zone in the crushing chamber eliminates choking and packing. Normal wear is evenly distributed over the entire face of the plate . . . *As a result Traylor curved jaw plates often outlast conventional plates by as much as 3 to 1.* Because of their more efficient application of crushing power, Traylor jaw crushers require less power per ton produced than any other jaw crushers. Send for bulletin which outlines all the famous features of Traylor Jaw Crushers.

There's a Traylor Jaw Crusher to fit every primary breaking requirement. Traylor builds four different types, each in a wide variety of sizes. Feed Openings range from 8" x 12" to 60" x 84"; capacities from 4 to 1000 tons per hours.

A Traylor leads to greater profits

Apron Feeders

Rotary Kilns

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CANADIAN MFR: Canadian Vickers, Ltd., Montreal, P. Q.

Primary Gyratory Crushers

Ball Mills

Jaw Crushers

Secondary Gyratory Crushers

35 years of dependable equipment performance

with **GULF FUELS** and **LUBRICANTS**

on the job *at the Warner Co., Devault, Pa.*

Gulf lubricants and fuels have been on the job for over 35 years at the Warner Company—helping to keep equipment "up," maintenance costs down.

One of Gulf's E.P. Lubricants contributes to longer life for kiln reduction gears; Gulf Dieselube H.D. provides efficient, economical lubrication for Diesel engines in trucks and shovels; and Gulf fuels contribute to top engine performance.

Let a Gulf Sales Engineer help you find opportunities for important savings through the use of Gulf Quality Lubricants and Fuels on your equipment.

Consult the telephone directory for the number of your local Gulf office.

GULF

Gulf Oil Corporation • Gulf Refining Company
1822 Gulf Building, Pittsburgh 30, Pa.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Best way to make your contracts pay—

SPECIFY GM

in all your Construction Equipment

PRODUCTION UP 30%—FUEL COSTS CUT 30%

Arizona Sand & Rock Company replaced a 4-cycle Diesel with a 2-cycle GM Detroit Diesel on this pug mill. Despite clouds of dust, maintenance costs dropped 25%—and production control is better with fast-acting, 2-cycle Detroit Diesel power.

KEEP 600,000-YARD CONTRACT GOING

Marsolino Construction Co. relies on GM Detroit Diesel-powered Ingersoll-Rand Gyro-Flow compressors to keep this 600,000-yard contract moving. They report the Detroit Diesels "start easily—are dependable and economical."

CUTS FUEL COSTS 40%—UPS PRODUCTION 25%

When Miami's R. E. Vaughan, Inc. switched from a 4-cycle Diesel to a 2-cycle GM Detroit Diesel on this ditcher, production jumped 25%—fuel costs dropped 40%. They report the Detroit Diesel delivers more power at less cost, too.

TRAVELS 35 M.P.H. ON THE HIGHWAY

Speed like this *between* jobs means more time on the job for this GM Detroit Diesel-powered Warco grader operated by Michigan's Henry Schmid Sons. Company's Detroit Diesel-powered dragline has worked over 17,000 hours on $100 for repairs.

Name the construction equipment you need—and it's a sure bet that you can get it powered with a General Motors Detroit Diesel.

For more than 150 manufacturers offer GM Detroit Diesel power in over 1,000 different applications—*because it's America's first choice Diesel!* With their reputations riding on every piece of equipment they sell, it's certain these manufacturers pick the best Diesel available to power their products.

And when you specify a GM Detroit Diesel in your construction equipment you get a Diesel that costs less to buy, less to run, and less to maintain.

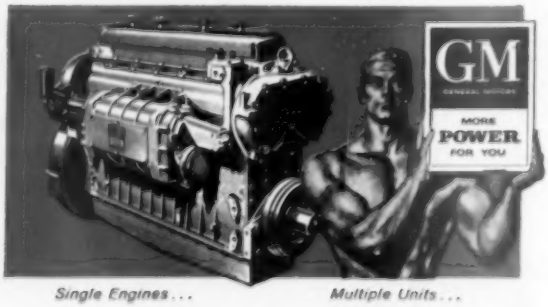
You get a Diesel that delivers more power from a smaller, lighter engine.

And you get a Diesel backed by a nationwide network of GM Detroit Diesel Distributors ready to give you fast service and quick delivery of low-cost parts *day or night.*

Your local GM Diesel Distributor or dealer can give you the list of equipment powered with GM Detroit Diesel engines. Call him today or write direct.

DETROIT DIESEL

Engine Division of General Motors, Detroit 28, Michigan



Single Engines . . . *30 to 300 H.P.*

Multiple Units . . . *Up to 893 H.P.*

AMERICA'S LARGEST

DETROIT DIESEL POWER

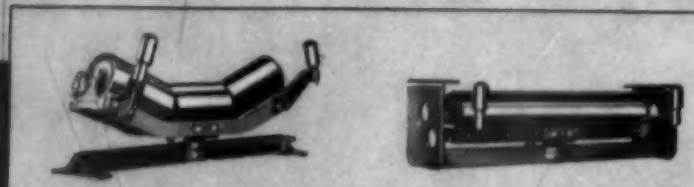
NO REPAIRS IN 10,000 HOURS

In 1951, Minnesota's Phelps-Drake Construction Company bought a GM Detroit Diesel-powered Lima Paymaster. And in 1953, they bought a second Paymaster plus a Wellpoint pump—both GM Detroit Diesel-powered. At last report none of the engines had any repairs, were still going strong after more than 10,000 hours. Phelps-Drake also reports production is high—fuel cost low—with Detroit Diesel power.

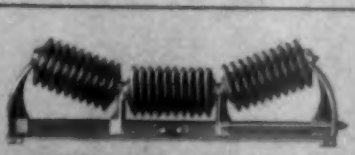
BUILDER OF DIESEL ENGINES

THERE'S A *Continental* IDLER for every purpose


STANDARD DUTY IDLER


SELF-ALIGNING TROUGHING IDLER

SELF-ALIGNING RETURN IDLER


RUBBER DISC IMPACT IDLER


FLAT ROLL

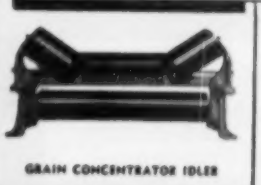

SELF-ALIGNING FLAT BELT IDLER


FLAT BELT IDLER


HEAVY DUTY IDLER


GRAIN FLAT BELT IDLER


PICKING TABLE IDLER


GRAIN CONCENTRATOR IDLER


UNIT STAND IDLER

Belt conveyors are used for handling many types of material. For this reason, Continental manufactures a variety of Idlers each designed to best take care of a particular application.

When ordering your next Belt Conveyor specify Continental Idlers and take advantage of our complete line.

Most standard size Idlers can be shipped FROM STOCK. Other sizes can be shipped promptly.

Specify CONTINENTAL

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CONTINENTAL GIN COMPANY
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ENGINEERS CGC ATLANTA • DALLAS • KNOXVILLE • MEMPHIS CGC MANUFACTURERS
NEW YORK 17, NEW YORK

Many Users Say This Belt Outlasts Them All

The Ray-Man Conveyor Belt features a new and different construction of covers and strength member to resist cuts, tears and abrasion to a degree never before attained. R/M's exclusive "XDC" Cover provides a degree of protection and long life not possible with any other belt. Inside this cover, Ray-Man Conveyor Belt combines elastic cushioned strength member plies in an envelope of strong, yet flexible synthetic fabric to resist gouging and tearing ... to take the impact of large, abrasive lumps... to permit the belt to trough easily and train naturally.

Like all Manhattan heavy duty conveyor belts, Ray-Man is moisture resistant and mildew-proof. It requires no breaker strip and holds fasteners considerably better than other types of belts. Let an R/M representative show you the advantages of Ray-Man as well as other R/M conveyor belts, including Homocord, with its extra cushion for unusually abusive shock loading. He'll help you select the belt best suited for your job . . . one designed to give you "More Use per Dollar." Write for Bulletins 6906 and 6915.

RM-6906A

RM

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RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls

How to CUT CLEARING COSTS

To help you clear land faster and cheaper, here are NEW IDEAS developed by clearing specialist Wade Lahar Construction Co. These "tricks" will help Lahar and their 22 International tractors finish a 23,500-acre job at Buford Dam 7 months ahead of an 18-month schedule.

One pass levels 18-inch trees—Where clearing to ground level is your primary job, Contractor Lahar recommends a big International tractor and V-shaped cutter. The cutter shown was designed and built by Herman Hackler, project manager, at Lahar's home plant in Mountain Home, Arkansas. Four 200 hp International TD-24's, so equipped, are handling most of the Buford Dam reservoir clearing near Atlanta, Georgia. In typical operation, they cut over so much land that 18 other International tractors are

1-to-5 slopes, 1,300 acres per month—Your TD-24 will efficiently clear trees from steep grades as well as from level ground. Here's what Herman Hackler, project manager for Lahar on the $1,611,560 contract, says about this big 200 hp, 8 mph crawler: "TD-24's high-low steering range keeps cutter against the tree until it falls, even on steepest slopes. This factor, plus the "24's" great power, excellent traction, and over-all balance, is letting us crawler-cut 99% of our Buford Dam job, despite slopes averaging 1-to-5, and, in some places, 1-to-4. Our fleet of *22 International tractors*—11 TD-24's (four of them with cutters), six TD-18's, three TD-14's, and two TD-9's—clears and rakes 1,300 acres per month. This production, in our opinion, could not be exceeded by any other make of tractor!"

Burn, turn with one tractor—On big jobs, Mr. Lahar suggests use of one medium-sized tractor to handle burning of brush piles. This leaves bigger machines free for production work. Note how clear the raked ground is behind tractor. When Lahar's job is done, some 14,000 acres will be completely cleared; about 9,400 acres partly cleared, with some trees left standing in the water to benefit future water life.

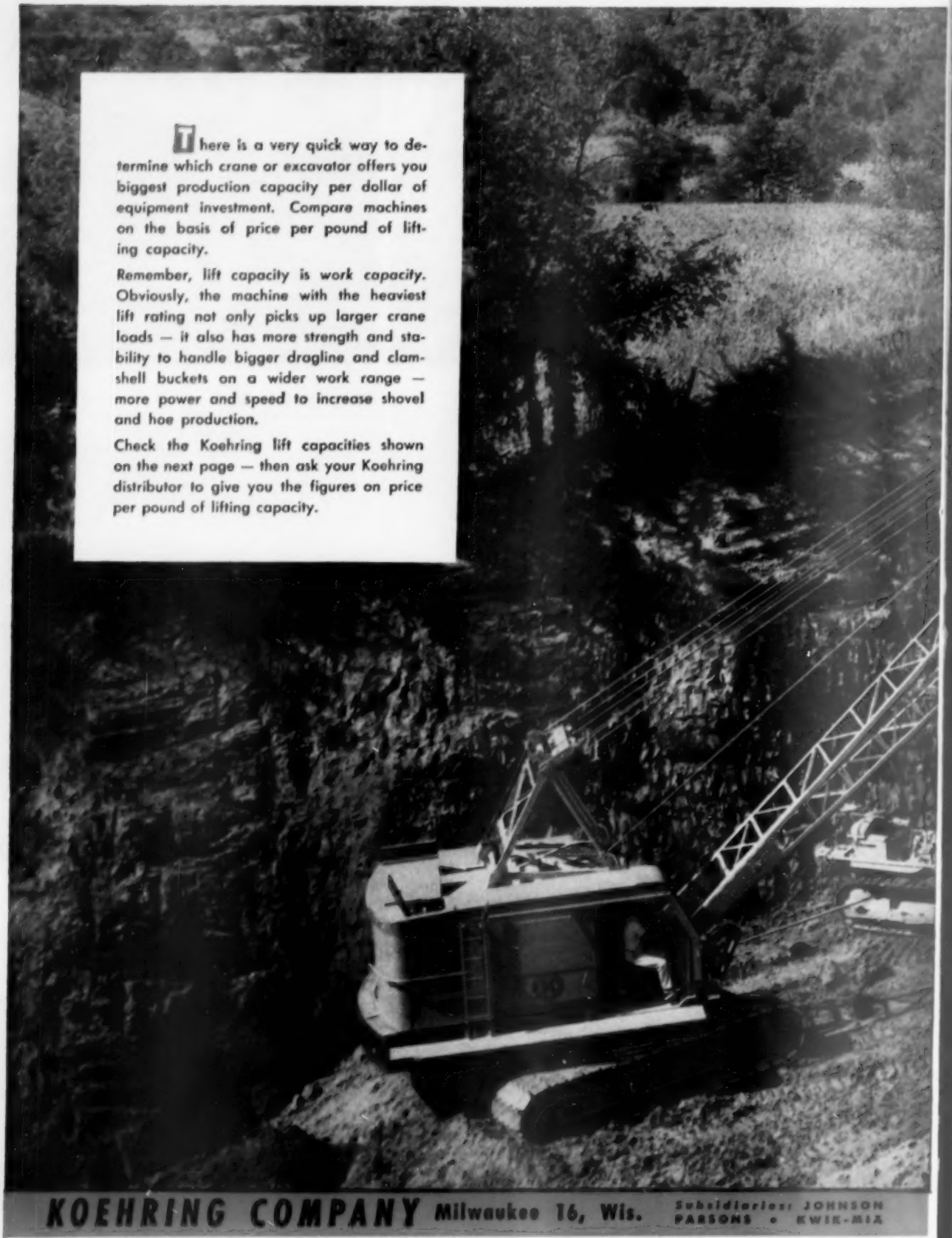
Team decking boosts output—Where terrain permits, three to six of Lahar's 22 IH crawlers team to rake and pile the cut brush and trees. This gives two advantages . . . (1) rakes, by catching both ends of fallen trees and brush, pick up material lying between tractors which normally would require separate pass . . . (2) one pass per team is all that's needed to provide a clean swath.

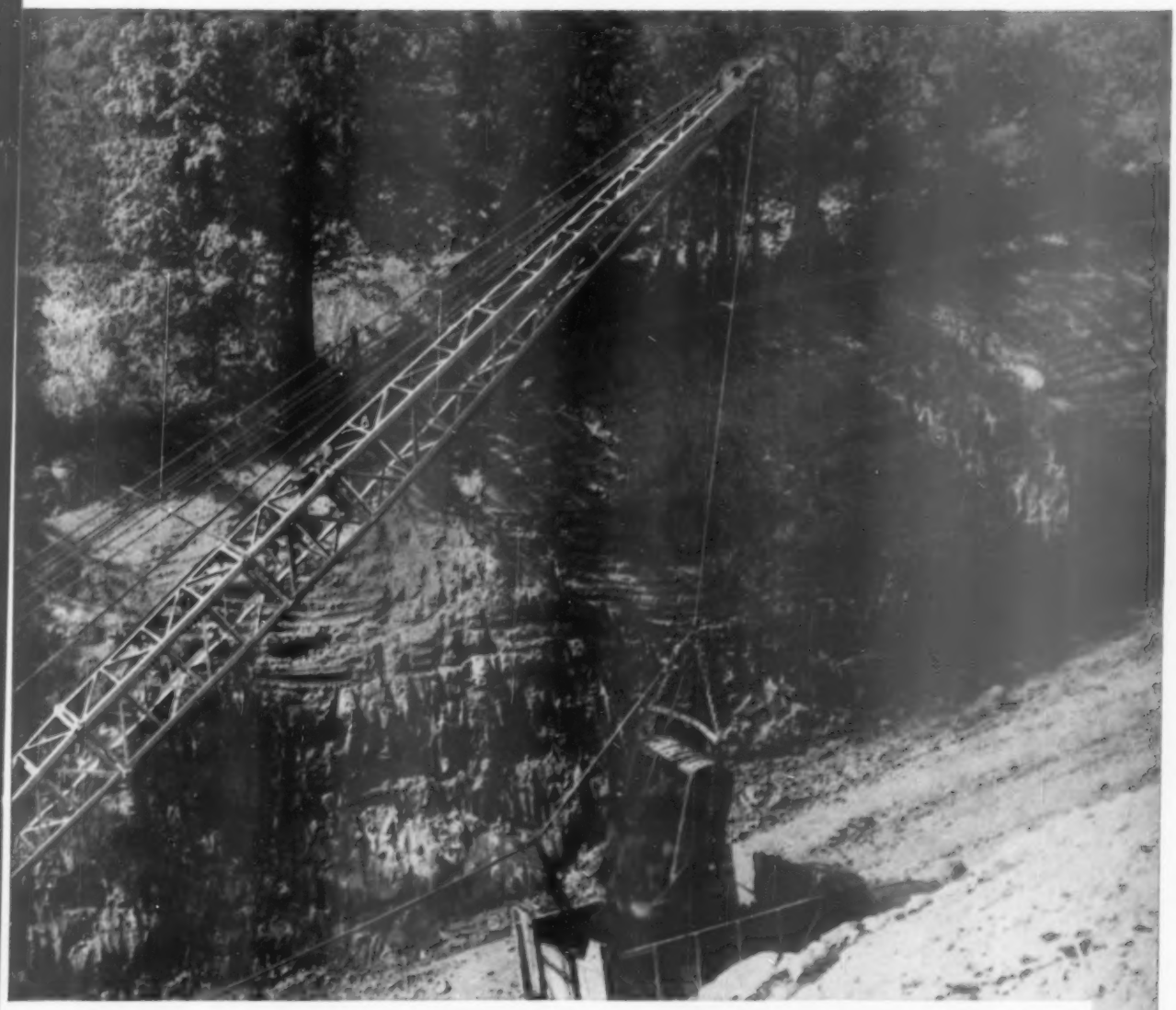
kept busy decking and burning. One pass of their 13-ft long, 14-ft wide blade slices saw-like through brush, pine, and mixed hardwoods up to 18 inches in diameter. For scattered trees up to 12 inches in diameter, a similar though smaller cutter is used on a 66 dhp International TD-14A. Both TD-24 and TD-14 have a canopy of 2 and 2½-inch pipe. This protects operator and machine. Entire canopy and cutter assembly pins to regular A-frame . . . can be quickly detached and interchanged with standard or other special blades.

Blade "saws" larger trees—If your clearing work involves trees larger than 18 inches, here's another idea from Wade Lahar Construction Co. Using same mild-steel cutter blade as on smaller trees, have TD-24 operator "see-saw" back and forth a few times to cut the trunk. Just a few seconds' work with the 64,000-lb TD-24 will topple the tree.

Careful in-the-field maintenance boosts output, too. Left, mechanic uses compressed air to blow dirt and leaves from TD-24 radiator core. Right, special steel tooth, 2½ ft long with 18-inch overhang, is welded to TD-24 blade. Four teeth and top blade extension are used per raking tractor.

Winches logs from swamp—Clearing from marshy areas may present you with quite a problem too. Wade Lahar Construction Co does this work, 1⅞ of their 23,500-acre Corps of Engineer job, with chain saw crews and winch-equipped TD-9 and TD-18 crawlers. After winching in, tractors skid timber to central area.


There is a very quick way to determine which crane or excavator offers you biggest production capacity per dollar of equipment investment. Compare machines on the basis of price per pound of lifting capacity.
Remember, lift capacity is work capacity. Obviously, the machine with the heaviest lift rating not only picks up larger crane loads — it also has more strength and stability to handle bigger dragline and clamshell buckets on a wider work range — more power and speed to increase shovel and hoe production.
Check the Koehring lift capacities shown on the next page — then ask your Koehring distributor to give you the figures on price per pound of lifting capacity.
KOEHRING COMPANY Milwaukee 16, Wis.
Subsidiaries: JOHNSON PARSONS • KWIK-MIX



Check price per pound of lifting capacity

KOEHRING MODEL	SIZE DIPPER	KOEHRING LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load)		PRICE PER POUND OF LIFT CAPACITY*
205 CRAWLER	½-Yd.	20,000 lbs.	30-foot boom at 10-ft. radius	?
205 ON RUBBER	½-Yd.	30,000 lbs.	25-foot boom at 12-ft. radius	?
304 CRAWLER	¾-Yd.	27,800 lbs.	35-foot boom at 12-ft. radius	?
304 ON RUBBER	¾-Yd.	50,000 lbs.	30-foot boom at 10-ft. radius	?
405 CRAWLER	1-Yd.	40,000 lbs.	40-foot boom at 12-ft. radius	?
605 CRAWLER	1½-Yds.	72,300 lbs.	50-foot boom at 12-ft. radius	?
1005 CRAWLER	2½-Yds.	159,000 lbs.	50-foot boom at 12-ft. radius	?

Figures available on request—ask your Koehring distributor for them.

What's Happening

IN OTHER FIELDS OF INTEREST TO THE ROCK PRODUCTS INDUSTRY

February, 1956

An oil well cementing material has been developed by Dowell, Inc. The product, "Detex," is not portland cement with new additives, but is comprised of a phosphoric acid, an aluminous material, and a fluoride accelerator. It is claimed not to shrink on hardening; it has a controlled setting time; and will tolerate more than 20 percent contamination by drilling muds. It has been reported to be effective in temperature ranges from 60 to 300 deg. and is particularly applicable in ranges from 110 to 215 deg. Pressure is said to have no effect on the setting of the material, thus speeding cementing operations.

An abandoned slate quarry is being used by Esso Standard Oil for storage of about 1,000,000 bbl. of fuel oil in Pennsylvania. The quarry, about 65 miles from the firm's Bayway Refinery, Linden, N. J., is connected to the refinery by pipeline. It also serves as a method of protecting the fuel oil in case of an atomic attack. The quarry is located away from expected target areas and should not normally be subjected to bomb attack. However, if it were bombed, it could probably resist any type attack except a direct hit or near miss.

Construction contract awards, in the 37 states east of the Rockies, totaled $21,824,523,000 for the first eleven months of 1955, according to an **F. W. Dodge** report. This was an increase of 22 percent over the same period in 1954. Non-residential building contracts for the 1955 eleven-month period amounted to $7,770,004,000, an increase of 21 percent; residential contracts totaled $9,474,053,000, up 22 percent; and utilities and public works $4,580,-466,000, up 21 percent.

Labor unions gained a million members from the end of 1951 to the beginning of 1955, but barely kept up with the growth in the nation's work force. This brought total membership of the labor organizations to 18 million, including 1 million members in Canada, according to a report by the Labor Department. In the feverish organizing years between 1935 and 1945, union membership rose from 3.5 million to 14.5 million. Since then, the increase has set a modest pace.

Another theft has been reported; this time 44 mercury fulminate blasting caps were stolen from a limestone company's powder house. The caps, extremely dangerous and easily exploded, may be set off by the heat of being held in the palm of the hand.

Plans for a proposed toll road interlocking West Virginia, Virginia, and North Carolina, have been shelved until the present West Virginia turnpike shows improved revenues.

Farms are growing larger in the United States, according to a Census Bureau report. The average size of a farm in 1954 was 242.2 acres, up 26.9 acres from the 1950 figure to the highest level in the past century. The boost in farm sizes has been attributed to the decline in the number of small farmers and the rapid mechanization of agriculture. The number of U. S. farms had decreased to 4,782,393 by 1954, from 5,382,162 in 1950, although the average size of farms has been increasing since the 1935 census.

Kaiser Aluminum and Chemical Corp., Oakland, Calif., has announced a new $280 million expansion program which will increase the company's total primary aluminum capacity to 654,000 tons annually. Major projects under the program will be the building of a 220,000-ton aluminum reduction plant at Ravenswood, W. Va., and a 500,000-ton alumina plant near Gramercy, La. Chemical facilities and additional mill fabricating facilities are also included in the expansion program.

Heavy Construction awards, nationally, totaled $18,721,852,000 for the 52-weeks of 1955, which was 30 percent higher than 1954, and 19 percent ahead of the previous record year, 1952, as reported in Engineering News-Record. Construction contracts for the first week of 1956 totaled $160,459,000, substantially below the first week of 1955, which amounted to $414,944,000.

British Occupation Authorities have instructed that 0.3 percent of pulverized limestone be added to the bread flour at West Germany. Because of its high purity, limestone for this purpose is supplied by the Winterberg limestone quarry, near Bad Grund, operated by Steine und Erden G.m.b.H. of Goslar, Harz, West Germany.

A group of juveniles started machinery after hours at a concrete block plant at Muncie, Ind., and used it like a midway ride. They rode the buckets upward, then jumped off into the sand. They could have been killed either by falling or by being caught in the gears of the machinery. For variety, the youths broke windows in the plant, eight in all.

The average price for homes bought during the year ending last April was $13,700, or an increase of $1400 over the average price of $12,300 for the year ending April, 1954, according to a special advance report on a Bureau of Labor Statistics survey in the November issue of **House & Home.**

Salt shakers with filters made of diatomite, a marine silica, are being manufactured at the rate of several thousand daily by the Airko company at Clermont, Fla. The diatomite filter keeps the salt dry until it absorbs its full capacity of moisture, a length of time which varies with the humidity of different localities.

Ready-mixed concrete operations were temporarily halted at a plant in Baton Rouge, La., recently, when the motors of five ready-mixed concrete trucks had to be taken apart for repair. Syrup had been poured into the crankcases and gas lines.

THE EDITORS

New OCC Heavy-Media Vessel

THE 'LAST WORD' IN

SIMPLICITY

A Wholly New Approach to HMS

From top to bottom, the OCC Vessel is specifically designed to take advantage of the simplicity of the HMS process. The result is optimum metallurgical performance and trouble-free operation.

The previously common practice of adapting conventional types of equipment to Heavy-Media vessels necessarily resulted in cumbersome and complicated units. The outstanding advantage of the HMS process is its simplicity. Here are illustrations of how the revolutionary design of the OCC vessel capitalizes on this simplicity. A single rake performs both of the two basic HM separatory functions: maintenance of constant gravity in the medium; removal of sink. This rake is the only moving part in the vessel. There are no rotating parts in the medium; and no gears in its drive. The only friction is that between the rubber-tipped rake and the vessel bottom. For details . . .

Send for Information on Complete Pilot Plant Demonstration and Testing Services . . . Technical Bulletin

The ORE & CHEMICAL CORP.

Division: Mining & Milling Machinery

80 BROAD ST., NEW YORK 4, N.Y.

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SAYS SUP'T. STONEBRAKER OF A. J. GLASER COMPANY, MUNCIE, INDIANA

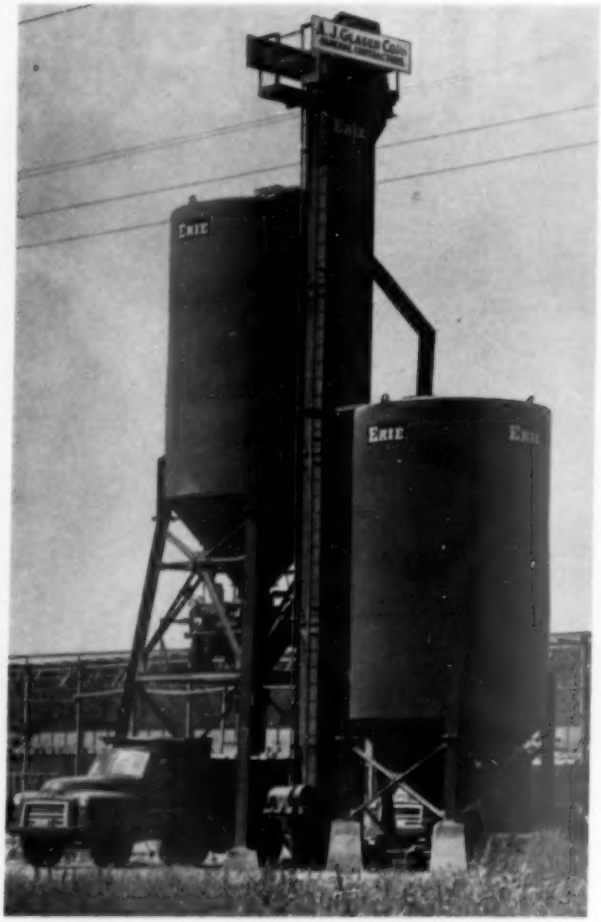
"And why shouldn't we be! We knock it down, move it and set it up all in 3 days. Makes a perfect setup for truck mixers, too!"

●

Continues Mr. J. H. Stonebraker, "We know Erie equipment. For the past 7 years we've been using their Strayer Portable Concrete Mixing Plant. Our experience with this unit prompted us to buy the Erie Strayer Bulk Cement Plant. We're more than satisfied with the installation."

Important as it is, quick knock-down and set-up aren't the only advantages our owners get out of their Erie Strayer Plants. Other features are: accurate, high output plants and fast service on repair parts.

If you're thinking about a portable batching or mixing plant, don't decide till you get the Erie Strayer story. Learn for yourself why most Erie owners repeat with Erie Strayer equipment when expanding.



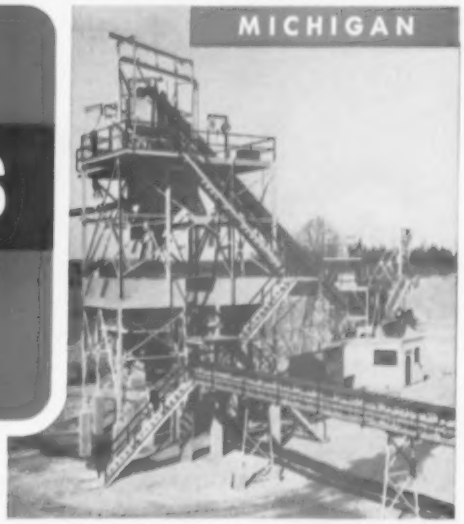
Glaser's installation includes: 2 CSB silos with a total capacity of 900 bbls; a 20 cu. ft. Cemetor (type DWH) with approximate capacity of 2400 cu. ft. per hour; and, a 50-TPH Elevator. One man handles entire operation. Sold by Seastrom and Company, Indianapolis, Indiana.

Write for Booklet GS, Dept. P26

ERIE STRAYER CO.

426 GEIST RD. **ERIE, PENNSYLVANIA**

modern AGGREGATE PLANTS by TELSMITH



Relieve yourself of all technical details. Get a complete, flexible aggregate plant designed for high capacity and low-cost production, planned and equipped by a single skilled organization — Telsmith.

MP-17

Send for Bulletin No. 278

SMITH ENGINEERING WORKS

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New VHS Dragline Gives 33% More Wear

Mr. W. D. Tierney, of Tierney Bros., Contractors of Lockport, Illinois, says: "The draglines on our 3500 Manitowoc lead a rough life. Therefore, when our distributor told us about the possibility of increased service with new TRU-LAY VHS draglines we decided to give it a chance.

This new dragline lived up to all the claims made for it. It lasted over four months under a variety of operating conditions—working in sand, gravel, earth and slag. We estimate that we got at least one-third more service from this dragline than we had been able to obtain before. And we particularly like the pre-lubricated feature."

VHS draglines are setting records like these on construction projects all over the country. They are made from a new grade of steel for wire rope—and are at least 15% stronger than Improved Plow Steel—the best grade available until now.

For Heavier Loads, Higher Safety Factor

TRU-LAY VHS's extra strength enables you to handle heavier loads with the same diameter line. And it gives a higher factor of safety for the entire service life of the rope.

For Shovel Hoist Ropes and Scraper Cables Too

TRU-LAY VHS was developed especially for the toughest applications in the construction field—draglines, shovel hoist ropes and scraper cables. In addition to greater strength, it is also tougher—more wear resistant. And it has all the advantages of preformed construction. This means that it lasts longer in the roughest construction services.

Cuts Down Time—Saves Money

Because it is tougher and more wear resistant, TRU-LAY VHS rope lasts longer, costs less to use and cuts "down time" of equipment for wire rope replacement.

TRU-LAY VHS ropes are easy to order. Just ask for TRU-LAY VHS Shovel Hoist Ropes, Scraper Ropes or draglines, in the size you want. You don't need any complicated specifications.

Your American Cable Distributor has TRU-LAY VHS *in stock now. See him or write to the nearest American Chain & Cable Company Office.*

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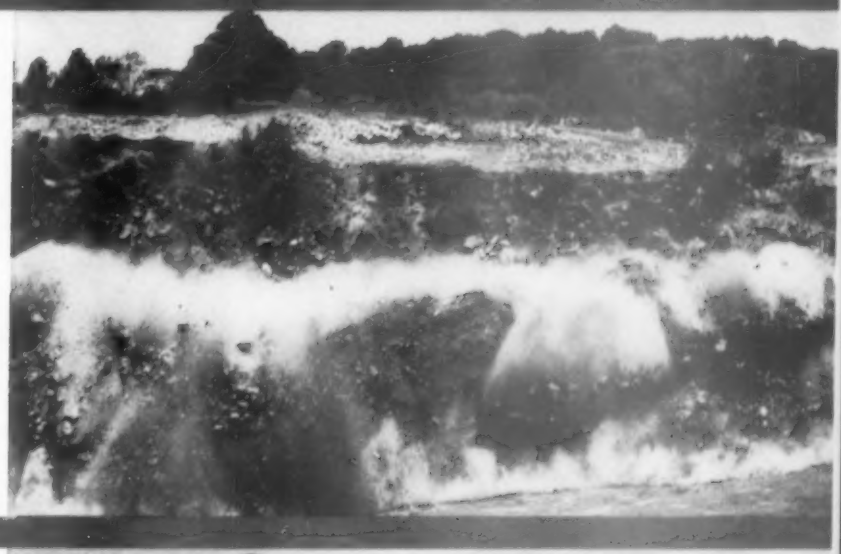
EXPLOSIVES

RESEARCH



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X856-1

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HERE IS A SMALL SHOVEL and front end loader that is fully operated by hydraulic power with independent crowd and hoist action—an excavator and loader that needs no wheel traction. It is the only shovel of its type featuring bottom dumping bucket—emptied completely and instantly!

Hydraulic crowd and hoist moves bucket out-and-up to follow contour of material—getting a full load with every stroke. This reduces both loading time and idle truck time to a minimum. Thus, gets the job done faster!

The Dempster-Diggster is the only small shovel that offers you all the important features of big shovels . . . Simultaneous and Independent Crowd and Hoist . . . Hydraulic Crowding . . . Hydraulic Hoisting . . . Variable Crowd Action at any Dipper Position in addition to Changeable Bottom Dumping Buckets for digging or loading. Write for complete facts on this revolutionary, power-packed hydraulic shovel. A product of Dempster Brothers, Inc.

Above Dempster-Diggster GRD-101 is equipped with 1½ cu. yd. loading bucket for materials-handling. Photo below shows Dempster-Diggster GRD-101 excavating with 1 cu. yd. bucket with four teeth.

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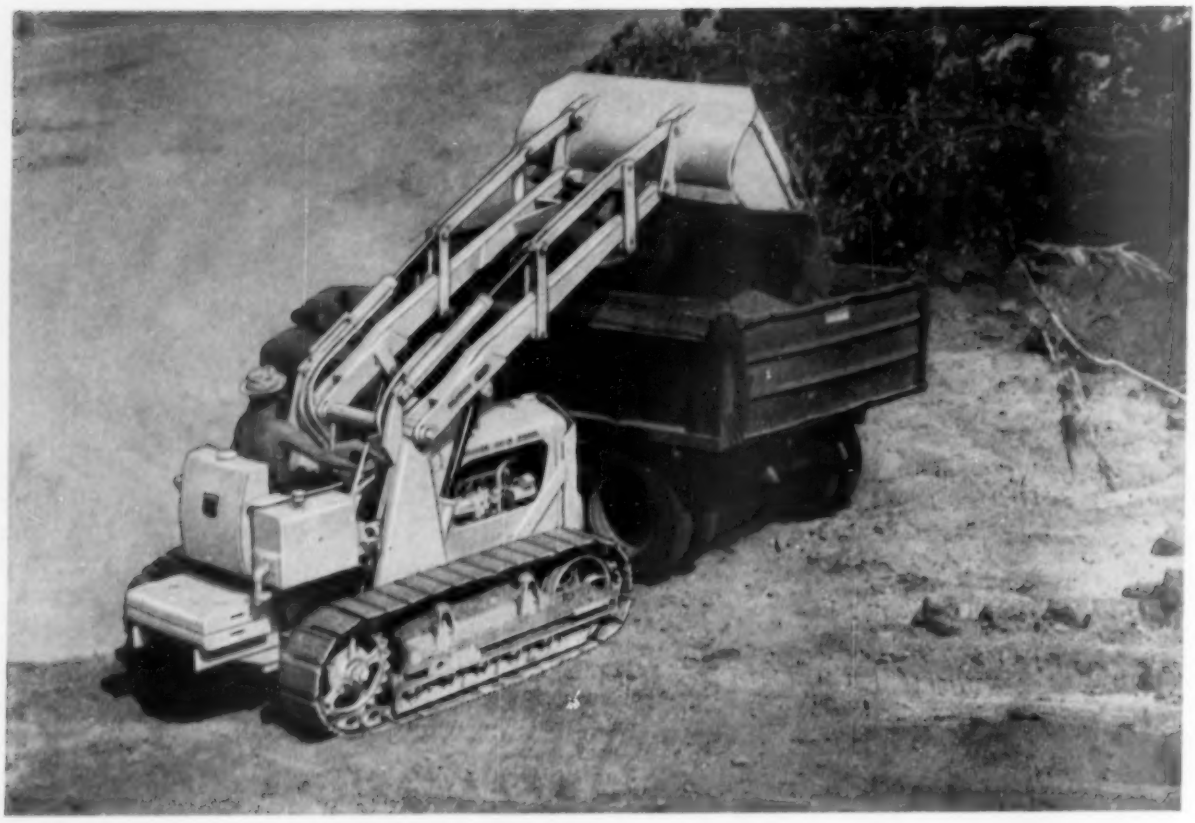

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OLIVER OC-12 LOADER with 53 d.b.h.

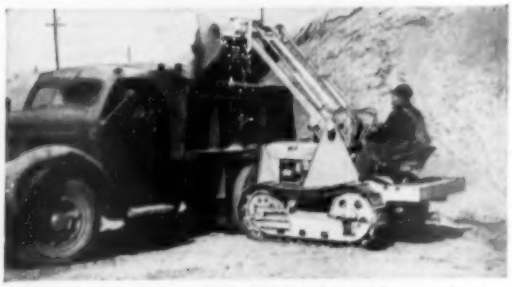
Capacity loading takes power and this unit has it! Fifty-three d.b.h. to master all conditions—with your choice of high-torque diesel or gasoline engine. Loader bucket is a special rollback type that fills up fast . . . automatically levels at any height to carry bigger loads with less spilling. Regular bucket capacity is 1¼ yd. For lighter materials there is a 2¼ yd. size.

Here's a balanced unit with stability and clearance. It reaches farther for loads . . . raises higher (10′ 4″) to clear truck sides. Roomy platform, handy controls and smooth steering—with two-track power—emphasize the OC-12's safe, easy operation. Let your Oliver Distributor show you the OC-12 in action. See why it's the capacity leader in its class.

THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

a complete line of industrial wheel and crawler tractors



Oliver OC-3 Tractor with 3WI Loader works anywhere. Eight attachments equip the loader for other jobs. Rear-mounted jet trencher can be used simultaneously.

Super 55's six forward speeds save time on every load. Easy to steer, low, stable, powerful. Gasoline and diesel models. Hydraulic system controls loader and three-point hitch tools.

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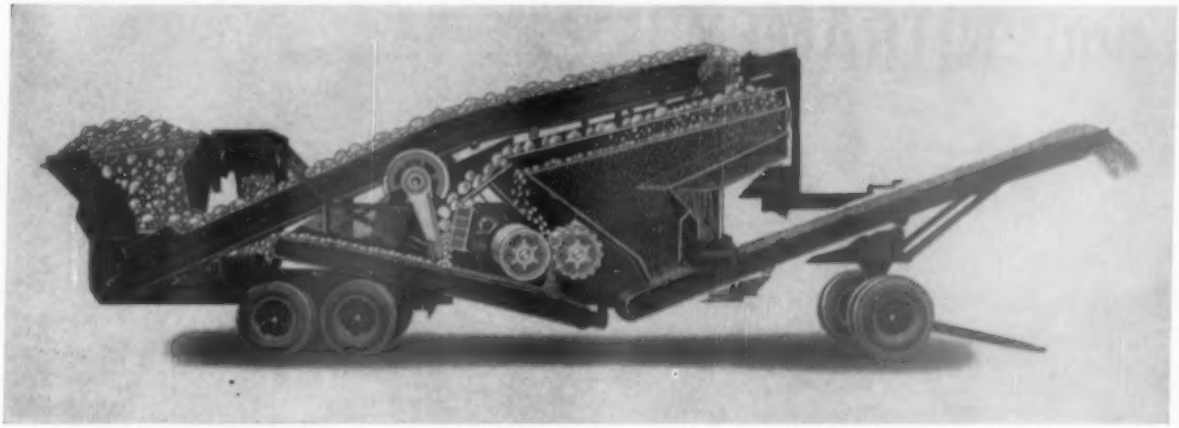

Universal 880 Gravelmasters—complete, compact crushing, screening and loading plants. Available in a range of sizes with reported capacities of 75 to 400 tons per hour.

What kind of output capacity do you need to operate at the best margin of profit? Big capacity? All you can get? Universal jaw crushers are available in sizes up to 42" x 48"; roll crushers up to 54" x 24"; impact breakers up to 57" x 60". And you can get Universal screening, loading and washing equipment in all sizes, too, to give you the right combination for profitable operation.

Need big capacity in a portable plant?

The Universal 880 Super Senior Gravelmaster comes with 40" x 24" rolls; 10" x 36" jaws . . . with plenty of screening and conveyor capacity to take care of the huge crusher output.

Is this more capacity than you need?

Perhaps the Universal 880 Junior "B" fits your requirements best. The 880 Gravelmasters come in a wide range of sizes. Any one of them can be used as a complete gravel crushing, screening and loading plant. Or, as a "secondary" in combination with Universal 546P primary units ranging in jaw size from 15" x 24" to 30" x 42".

Tell us your job requirements— write to the address below or consult your distributor. You'll get a carefully considered recommendation fitted to your needs.

MODEL	Junior "B"	Junior	Senior "A"	Super Senior
Jaw Crusher	10"x16"	10"x24" 10"x36"	10"x36"	10"x36"
Roll Crusher	18"x16"	24½"x16"	30"x26"	40"x24"
Gyrating Screen	2'x8' 2½	3'x10' 2½	4'x12' 2½	5'x12' 2½
Plate Feeder	19"	19"	25"	25"
Weight	28,600#	44,500#	54,000#	59,600#
CONVEYORS				
Under Conveyor	18"x10'	24"x14'	30"x18'	30"x19'
Feed Conveyor	20"x23'	24"x26'	30"x29'	36"x34'
Delivery Conveyor	24"x18'	24"x20'	30"x21'	30"x24'
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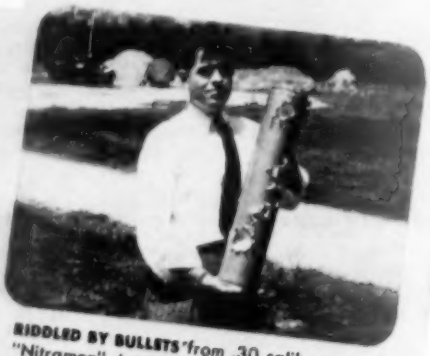
SAWING CAUSES FRICTION, but has no effect on "Nitramon." Blasting agent also refused to detonate in presence of other exploding materials under test conditions.

BURNED AT THE STAKE in a wood-and-gasoline fire, "Nitramon" does not explode, but merely decomposes without danger. High temperatures cannot detonate it.



RIDDLED BY BULLETS from .30 caliber rifles, "Nitramon" demonstrates insensitivity to impact. A large blasting cap also failed to cause detonation.

Dramatic film demonstrates greater safety of Du Pont's Blasting Agent line

Here is a new color film offering visual proof that "Nitramon" and "Nitramex" are the safest blasting agents ever made. In a series of dramatic tests, the superior safety characteristics of these insensitive blasting agents are demonstrated.

They cannot be detonated by heat, impact, friction, shock, or the strongest blasting caps. As the film shows, a special "Nitramon" Primer—itself relatively insensitive—does the job with maximum safety.

How to use the Du Pont team

Also presented, in step-by-step fashion, is the method of using "Nitramon" and "Nitramex" with maximum safety and blasting effectiveness. Schematic drawings and diagrams are included.

This film—intended to promote safer, more efficient blasting—is available for safety meetings at no cost. Simply contact your Du Pont Explosives representative or write on company letterhead to the branch office nearest you, or to E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

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FEBRUARY 20, 21, 22

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Smooth Operation is Key to Savings

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Someone suggested the old coin trick . . . balance a coin on it while it's running.

The next we knew the foreman was calling, "Come down and see for yourself." We went to the shop. And sure enough, there the penny was standing as still as you please.

What does that mean to you?

It means, here's a compressor that needs practically no foundation. And it means there's no wear and tear from vibration...less maintenance.

You get constant air supply with this machine, too. For this story: Call your nearby A-C office for complete information, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

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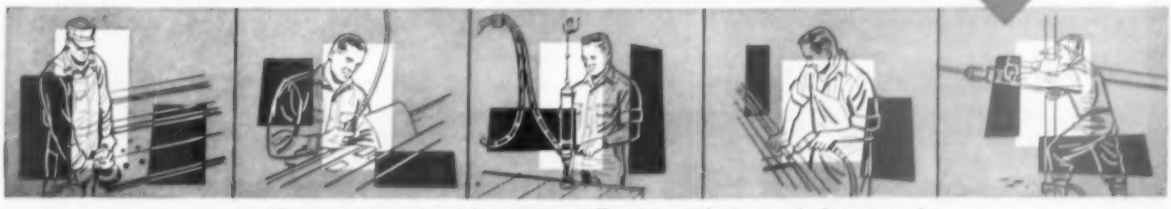


Ro-Flo compressors provide constant efficiency and air supply for air tools

EDITOR'S PAGE

Impact of Highway Program on Rock Products Industries

FEDERAL HIGHWAY LEGISLATION is slated for action before the new Congress and there will be several bills proposed to expedite the building of an adequate road system. The administration bill, which failed to pass in the 1955 Congress, is a dead issue and there will be no administration legislation as such proposed at this session.

It seems that the President and his advisers are prepared to go along with a bill sponsored by the democratic party which would provide for financing through increases in highway users taxes.

The climate for adopting legislation to lend more federal support and financing for an accelerated highway building program is good. Indications are that reasonably adequate highway legislation will be passed in this session.

Partisan politics and the pressures of special interests, as to financing methods, killed the 1955 bill but that proposal to spend $101 billion over a ten-year period to eliminate deficiencies in the nation's highways was not wasted effort.

The facts as set forth in that administration bill with regard to the urgent need for more adequate highways, the benefits to be derived and the ability to carry through to completion a program of such magnitude were well presented and have laid the groundwork for passing a good bill.

Public sentiment is undeniably in favor of federal action on highways and there is a willingness to pay for better roads. It is now generally recognized that the nation must at least double its investment in highways for at least ten years. Congress has before it a great opportunity to lay aside partisanship and delaying action, in the public interest.

The outcome will be a program costing somewhat less than the original proposal, but it will be nonetheless substantial and a forward step. Legislation is likely to provide for accelerated construction over a five- or ten-year period but, whatever the outcome, the need is for a long-range program providing financing that recognizes the need beyond any set period. With an expanding economy like ours, the need for highway building has no completion date and will be continuing.

Industry Requirements

Insofar as the rock products and concrete products industries are concerned, it has been determined that the requirements for aggregates, cement and concrete could be met even for the $101 billion highway program that was defeated, to meet the schedule set up for construction. Certainly, the needs for a scaled-down highway program, however large it may be, can be met by these industries once the scope of the program is known.

These industries continue to be operated at or near capacity without abnormal demands for highway building, but nevertheless can adapt themselves to meet the expected new requirements.

Ability of the portland cement industry to meet the expected added demands was a problem a year ago, but the industry has taken advantage of the time lost when the 1955 bill was defeated, to gear itself for the expected increased demands.

The greatest expansion program in its industry has been underway and some seventy-five million barrels will have been added, through a two-year building program, to the national capacity by the end of this year. This is important since it requires a year or two to build a new plant or make substantial increases in older facilities.

Producers of aggregates do not require comparable time for plant building. Where extra shift operations, stockpiling and minor additions in permanent plants will not suffice to meet the needs, the problem will resolve itself into securing and installing additional equipment when it is required.

Where completely new facilities are necessary at locations near to point of use, the availability of equipment and, in some cases, the availability of suitable sources of aggregates, are important.

There has been some recent talk about shortages of aggregates but there are adequate reserves in most areas. The shortages talked about are local and in scattered areas. No major construction has failed to be completed due to aggregate shortages.

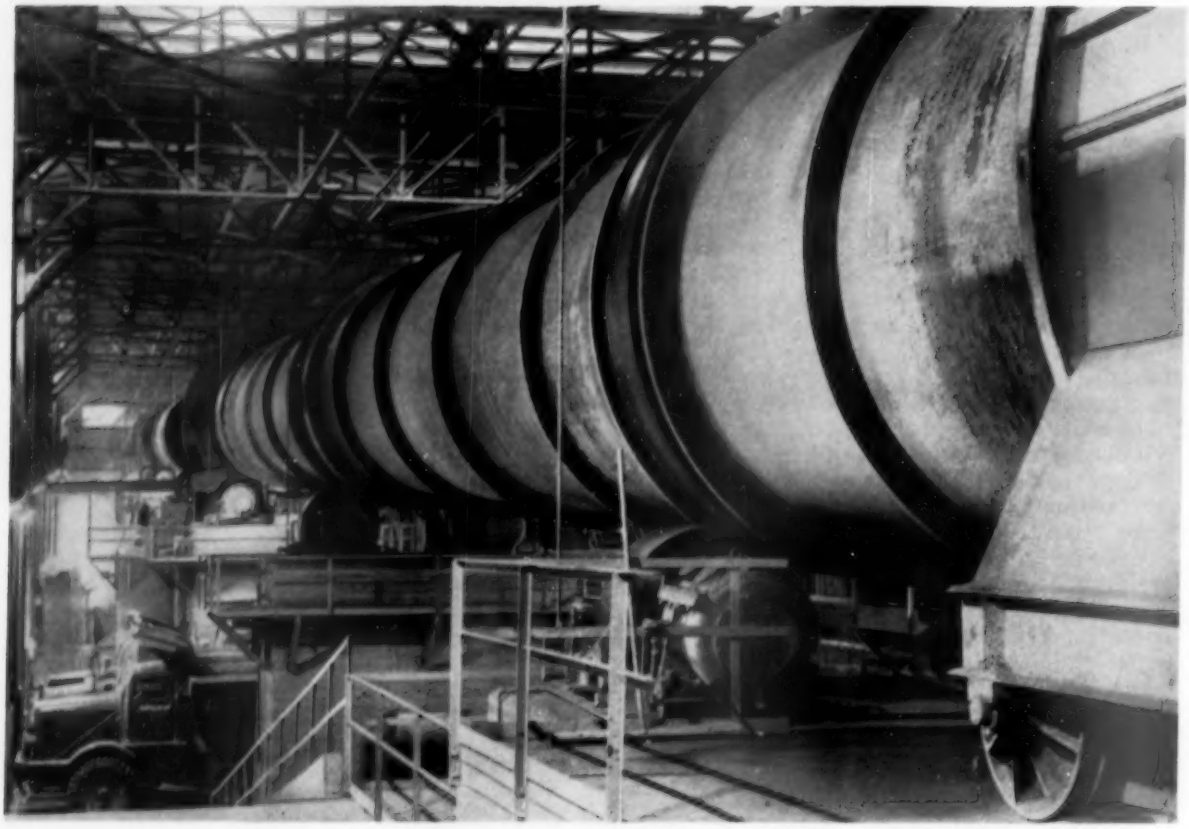
It may cost more to import suitable aggregates into certain areas where local sources are absolutely unfit but modifications in operations will often eliminate "shortages" where these deficiencies existed only because they lacked compliance with correctable provisions in specifications. Demands will determine whether the expense is justified. It is expected also that engineers' standards will sometimes be flexible enough to recognize the properties of available aggregates in order to permit use of locally available materials.

The outlook is such that it seems advisable for producers to make plans and order equipment ahead in order to get delivery when needed. There will be a rush to place orders by contractors as well as producers once a road program is approved, and delivery dates may become very unfavorable.

There is little prospect of lower prices for equipment in the months ahead, in fact they likely will increase, so it might be wise to invest now on the strength of present demands regardless of the road program.

Bror Nordberg

Profitable trends in the use of refractories



For peak production switch to Laclede high alumina kiln liners

When your kilns operate day and night, long refractory service and little maintenance become critically important. Then the use of Laclede high alumina kiln liners gives you the satisfaction and dependability you need. They offer advantages of unusually low porosity, high strength, high density, high resistance to fluxing action of clinkers and possess high refractory values.

Laclede 70 (70% alumina) liners are made of high grade, selected Missouri diaspore, expertly blended with bauxite and bond clays. They contain materials and blending skill, plus quality control that produces only "quality-first" refractories. Laclede Peerlac (60% alumina) meets the same type of standards.

Prompt service is also a Laclede specialty. Call on your nearby Laclede representative soon.

Uses of LACLEDE High Alumina Kiln Liners

LACLEDE 70
(70% Alumina) — particularly suited for hot zone liners in cement, lime, dolomite and magnesite kilns.

LACLEDE PEERLAC
(60% Alumina) — for kiln areas requiring lining material of higher refractory value than high duty and super duty fire clay brick.

LACLEDE-CHRISTY COMPANY DIVISION

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ROCKY'S NOTES

NATHAN C. ROCKWOOD

HAVING REVIEWED IN SOME DETAIL the papers on components of portland cement clinker and of hydrated cement, the present article will discuss and comment on those published in the proceedings of the Third International Symposium on the Chemistry of Cement* on the durability of portland-cement concrete, and the factors which influence it, in so far as known. It might be suggested here that apart from the generally recognized effect of sulphate solutions on cement high in alumina compounds and high in high tricalcium silicate, there has not been much proof established as to the specific effects of any of the various components of properly made cement clinker on concrete durability, where the aggregates themselves were not also involved.

Dr. F. E. Jones, Building Research Station, Great Britain, reviewed at considerable length the literature on "The Physical Structure of Cement Products and Its Effect on Durability." He gave special attention to the work T. C. Powers and his associates at the Portland Cement Association Research Laboratories, U.S.A., which he referred to as a "remarkable series of papers." Presumably American readers are sufficiently familiar with Powers' theories on the structure and physical properties of hardened portland cement pastes that a review of Dr. Jones' summary of it is unnecessary here. The only criticism of Dr. Jones appears to be the arbitrary distinction made by Powers between the various kinds or forms of water that may exist in the set paste, and the method adopted of distinguishing between them. However, this question of how much of the water is "water of constitution," or chemically bound in crystals or as OH ions, and how much is actually more or less free H_2O is something that at this stage of knowledge cannot be definitely determined; and Powers' assumptions, apparently, are as good as any for building up a theory that answers the observed phenomena.

Dr. Jones brought out the point that the papers of Powers and associates he was summarizing had to do only with cement pastes, and that in dealing with mortars and concretes, one must consider the physical properties of the aggregates as well. Since this Symposium was published, as we have noted on this page in previous issues, Mr. Powers has covered much the same territory on aggregates in concrete as he did originally with cement paste (now published as Bulletin 58, P.C.A., "Basic Considerations Pertaining to Freezing and Thawing Tests"). It is evident that aggregates can have pore structures more or less similar to cement pastes, and that the physical properties of mortar and concrete will be correspondingly affected. In his review of the literature on aggregates, Dr. Jones confined his discussion to studies of porosity, absorption and permeability, thermal movements, surface texture, and shape. He doesn't, to our mind, make a satisfactory case to show that neither the cement paste nor the aggregates alone can give complete answers to the problem of concrete durability, since it is well known that combinations of these two ingredients in concrete sometimes give results contrary to those anticipated.

Discussing Dr. Jones' paper, J. W. Harding, of the same Building Research Station, summed up "the immediate obstacles in the way of a more physical treatment [of the water character] are twofold:

"(1) the limitations of x-ray analysis in elucidating surface, as distinct from bulk, structure, and in fixing the location of hydrogen atoms, and

"(2) the intractable nature of the calculations to which existing theories of chemical valency lead in all but the simplest types of molecules or crystal lattices.

"Any adequate treatment of water adsorption equilibrium based on molecular theory will automatically entail a consideration of the physical mechanism of swelling in solids containing micro-pores."

Dr. J. H. P. Van Aardt, South African Council for Scientific and Industrial Research, made a pertinent suggestion in his discussion. He said: "If the paste and aggregate are of good quality, the next important factor is the bond between the aggregate and the cement paste. Some factors affecting bond strength have been discussed by the author. All the writer [Dr. Van Aardt] would like to point out is that more work is required in connection with possible reactions between aggregate and cement paste. At present the only well-known reaction between aggregate and cement paste is the alkaline interaction. Its harmful effect on cement products is common knowledge, but it may be that other types of interactions are advantageous. The good bond strength between a calcareous aggregate and cement paste may not be due, purely, to the surface texture of the aggregate. A possible interaction should not be entirely excluded."

Dr. T. Thorvaldson, University of Saskatchewan, Canada, had a paper "Chemical Aspects of the Durability of Cement Products," in which he reviewed various experiences in the search for a cement resistant to the chemical action of natural waters, especially those containing sulphates. The poor resistance of concretes in sulphate waters, where the proportion of alumina in the cement is relatively high is, of course, common knowledge. Moreover, the following comment from such a well-known authority is interesting: "Many claims are made for improvement through use of pozzolanic materials and slag cements. The results obtained with pozzolanas are far from consistent, which is not surprising when one considers the great differences in composition, physical properties and chemical activity of such materials, and possible variations with richness of mix, amount of additive, conditions of exposure and composition of the cement."

Dr. Thorvaldson discussed the effect of these major components of cement on sulphate resistance (a) tricalcium aluminate; (b) tetracalcium aluminoferrite (C_4AF). It is now generally conceded that the first, in more than small percentages, is especially harmful in crystalline form; less harmful in glass form with the other components. He also discussed the effect of the minor components (a) free calcium oxide, (b) magnesium oxide, (c) the oxides of sodium and potassium; mention being made only of the harmful effects of the alkali aggregate reaction, which has received so much publicity in the last few years.

A portion of Dr. Thorvaldson's paper was devoted to the effect of acids on portland cement concrete. Dr. Van Aardt said this was a serious matter in South Africa in concrete sewer construction. He made one statement that may come as a surprise to many American concrete specialists. He said: "Our experiments have shown that if a calcareous aggregate (limestone or

(Continued on page 132)

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LABOR RELATIONS TRENDS

By NATHAN C. ROCKWOOD

Written Exams for Promotion Not in Contract

AN INTERESTING CONTROVERSY as to employer's right to conduct a written examination to test an employe candidate's qualifications for promotion was determined recently by an arbitrator in re Marquette Cement Manufacturing Co. (Superior, Ohio, plant) and the United Steel Workers of America, Local 3986 (C.I.O.). The arbitrator was Herman L. Barnes, selected by both parties from a list submitted by the Federal Mediation and Conciliation Service.

A part of his report, after defining the issue, as above, reads as follows: "The issue as presented by the company does not cover the facts as submitted by the union as to the rights of the company to insist on a written examination in determining the qualifications of an employe.

"The union contends that when an opening for a new job was posted, the company required a written examination. The applicants for the job were T. M., with department seniority dating from March 2, 1942; J. S., with department seniority from April 8, 1943; and V. E., with labor pool seniority from July 7, 1938. T. M. and J. S. refused to take the written examination and were disqualified by the company; the job was given to V. E., who had taken the written examination.

No Contract Provision

"The following terms of the July 15, 1954, Agreement were cited as applicable to the issue:

'SECTION VII—MANAGEMENT'

" 'The union and its members recognize that the right to manage the plant and works and to direct the working forces is vested exclusively in the company. Among these rights are the right to hire, suspend, discharge, promote, demote, transfer, assign jobs, increase forces and decrease forces. It is agreed that the company shall not use these rights and powers in conflict with any provision of this agreement.'

'SECTION V—VACANCIES'

" 'A. It is understood that all vacancies will be filled immediately by the management in accordance with the most practicable arrangement at the time of occurrence until applicants have been chosen in accordance with Paragraph C of this section.

" 'B. All vacancies shall be filled:

" 'First, by the oldest employe within the department.

" 'Second, by the oldest employe within the plant.

" 'It is understood that an employe must have the ability and physical fitness to perform the job.

" 'C. All new jobs and vacancies, such as mentioned above, shall be posted on the bulletin board for a period of five (5) days to allow any employe to make application in writing. Such applications shall be given prompt consideration by the management and the oldest applicant in terms of seniority as defined in paragraph B above shall be chosen for the job subject to ability and physical fitness to perform the job.

" 'Employes so chosen shall be installed in his new job as soon as practical but within ten (10) days after expiration of the posting period. If after a reasonable trial period, any applicant proves unsatisfactory, he shall be reinstated in his old job and the next applicant shall be given a trial, until a satisfactory applicant is determined. Any employe bidding out of his department into another shall forfeit his former departmental seniority.'

Arbitrator's Reasoning

"It appears that when the written examination was demanded to determine the qualifications, the union objected on the grounds that it was in violation of the agreement and advised the employes to this effect. The company proceeded with the written examination, as it was their contention that the agreement gave them the right to judge qualifications of an employe by requiring written examination if it so desired.

"The union contends that this is the first and only time a written examination was ever invoked by the company — to which the company concurred.

"The company contends that the Agreement clearly establishes its rights to determine the qualifications of employes. However, it must be understood that the contract provides that consideration must be given to seniority and ability to perform the job. There is no provision in the agreement that permits an employe with less seniority to be advanced over one with more seniority on the premise that he is better qualified to perform the work. The senior employe must be advanced if in the judgment of the company he can perform the work in a satisfactory manner.

"When the agreement was signed July 15, 1954, the manner of selecting employes for advancement to a new job or vacancy had been clearly established and any change should have been incorporated in the agreement.

Award

"The award is made to the union, and its members are not required to take written examinations for new jobs or vacancies under Section V — Vacancies — of the July 15, 1954, agreement."

Striking Teamsters Resume Work in Southern California

ABOUT 1600 DRIVERS OF THE TEAMSTERS' UNION, striking against 29 sand and gravel companies in Southern California, have returned to work after three months, following a mutual agreement between union and management to resume work while key issues are arbitrated. The still unsolved issues include: the Teamsters' pension plan; guaranteed work days; seniority; discharges; Veterans' Day as a paid holiday; weekly paydays; wage rates on some classifications; and the length of the contract. Agreement was reached on a general 15-cent hourly wage increase, liberalized paid vacations and increased shift premiums. The settlement also provides that an employer's suit in Federal Court and charges by both sides before the N.L.R.B. be dropped.

The strike had seriously curtailed construction in the Los Angeles area, because it shut off over 90 percent of the area's usual supply of ready-mixed concrete. Estimates of the amount of construction held up have run as high at $500,000,000, while unemployment in the construction industry has been reported to have been as high as 100,000.

New Office Address

MISSOURI PORTLAND CEMENT CO. announces that its new Kansas City district sales office is located at 106 W. 14th St. (Kansas City Power and Light Building), Kansas City 3, Mo.

Here are two good reasons why the smart mid-west quarry that assembled this mobile drilling unit is getting tops in drilling efficiency and economy:

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PEOPLE

IN THE NEWS

Celotex Names Treasurer

CHOATE W. JOHNS has been elected treasurer of The Celotex Corp., Chicago, Ill., according to an announcement by Otis S. Mansell, president. Mr. Johns has been secretary since 1945 and succeeds Alfred I. Schimpf, who has retired.

Choate W. Johns

Vice-President of Sales

RICHARD C. NEWBOLD has joined George F. Pettinos, Inc., Philadelphia, Penn., as vice-president in charge of sales. He was formerly president of the Lehigh Navigation Coal Sales Co.

Richard C. Newbold

and has had extensive marketing and sales management experience.

Raymond Walsh Retires

RAYMOND L. WALSH, assistant vice-president and chief engineer of Universal Atlas Cement Co., New York, N. Y., has retired after 30 years of service, but will remain in a consulting capacity. Chester D. Rugen has been appointed assistant vice-president of engineering, and Robert B. Jordan has been appointed chief engineer.

Mr. Walsh became associated with Universal Atlas at Chicago in 1925 as assistant electrical engineer, became electrical engineer in 1929, assistant chief engineer in New York in 1944,

Raymond L. Walsh

chief engineer in 1953, and assistant vice-president and chief engineer early in 1955. A native of Chicago, he is a graduate in electrical engineering from Armour (now Illinois) Institute of Technology. He is a member of the American Institute of Electrical Engineers and the Association of Iron and Steel Engineers. He has served with the Bureau of Accident Prevention and Insurance of the Portland Cement Association, as well as on the subcommittee for electrical hazards in quarry operations.

Mr. Rugen joined the engineering department in 1930. He became operating engineer in 1942, returned to the engineering department as project engineer in 1947 and was appointed

Chester D. Rugen

assistant chief engineer in 1953. He has served in all plants and has specialized in the performance, application and design of plant machinery and equipment. Born in Glenview, Ill., Mr. Rugen attended Armour Institute of Technology and graduated from Purdue University, Lafayette, Ind. He is a member of the American Institute of Mining and Metallurgical Engineers.

Mr. Jordan started with Universal Atlas in 1953 as assistant chief engineer, after serving as assistant chief construction engineer of the Fairless works in Morrisville, Penn. He first became associated with the U. S. Steel Corp. in 1937 in the construction en-

Robert B. Jordan

gineering department of the South works in Chicago. He became assistant chief design engineer in 1951. A native of Chicago, he attended the University of Illinois and graduated from the Illinois Institute of Technology. He is a member of the Western Society of Engineers and the Pennsylvania Society of Professional Engineers.

Re-Elected P.C.A. Chairman

EMORY M. FORD, chairman of the Huron Portland Cement Co., Detroit, Mich., has been re-elected chairman of the board of directors of the Portland Cement Association, Chicago, Ill. He has served on the board for 11 years, has been a member of the executive committee three times and has served on several special committees. Mr. Ford was elected chairman of the Huron Portland Cement Co. in 1953, after serving more than 11 years as president of the firm. He is also chairman of the board of Wyandotte Chemical Corp., and Floridagold Citrus Corp.

New directors elected by the Portland Cement Association are C. S. Crawford, president, Whitehall Cement Manufacturing Co., Philadelphia, Penn., and Allan B. Sunderland, president, Ash Grove Lime and Portland Cement Co., Kansas City, Mo.

Retiring members of the board of directors of the P.C.A. are H. B. Robeson, president, Nazareth Cement Co., Nazareth, Penn., and W. E. Tyler, president, Dewey Portland Cement Co., Kansas City, Mo.

50 Years of Service

MILTON MATHEWS, vice-president in charge of sales, Marblehead Lime Co., Chicago, Ill., was recently honored on his 50th anniversary with the company. He joined Marblehead as a clerk in the traffic department and advanced through the order department and sales department. He was appointed sales manager in 1922, secretary in 1938 and vice-president in charge of sales in 1947, the same year Marblehead Lime Co. became a subsidiary of Material Service Corp. Col. Henry Crown, chairman of Material Service, presented Mr. Mathews with a watch at a luncheon in his honor.

Senior Vice-President

JOHN W. BROWN has been elected senior vice-president in charge of marketing for National Gypsum Co., Buffalo, N. Y. He was also elected a director. Wade W. Hildinger, formerly director of general sales, succeeds Mr. Brown as vice-president in charge of general sales. Mr. Brown joined the company in 1935 as a salesman and has served as district sales manager, general sales manager and as vice-president in charge of general sales. Born in Clinton, Mo., Mr. Brown is a graduate of Central College, Fayette, Mo. He is also vice-president of the Asbestos Cement Products Association. Mr. Hildinger has been with National Gypsum Co. since 1942. He started as a general line salesman and was promoted to district sales manager, director of dealer relations, assistant general sales manager, general sales manager, and director of general sales. A native of Nash, Okla., Mr. Hildinger is a graduate of Phillips University, Enid, Okla.

Assistant Vice-President

JOHN R. KRINGEL has been appointed assistant vice-president of the New York Trap Rock Corp., New York, N. Y., according to an announcement by Wilson P. Foss, III, president. Mr. Kringel has been in the construction and quarrying field both in the United States and abroad for 20 years. He joined Trap Rock two years ago and served as superintendent of the Haverstraw plant for one year and then as assistant to Floyd J. Buffington, vice-president in charge of operations.

Sales Managers

C. M. LAMBE has been named industrial roof merchandising manager for United States Gypsum Co., Chicago, Ill. Harold W. Davis has been appointed merchandise manager of industrial gypsum, lime and paper products; George V. Lane, western regional dealer sales manager; and V. R. Belden, merchandise manager of dealer sales.

Assistant Operations Manager

CHARLES M. ADAMS has been appointed assistant manager of operations of the Huron Portland Cement Co., Detroit, Mich. A graduate of the University of Michigan, Ann Arbor, Mich., Mr. Adams joined Huron in 1941 as assistant superintendent of plants and vessels. He served as an officer in the U. S. Navy from 1943 to 1945. Upon his return from service, he was placed in charge of the distributing plants and steamships.

Charles M. Adams

Nazareth Appointments

ERNEST E. WILKEN has been appointed vice-president of production for Nazareth Cement Co., Nazareth, Penn. He was formerly general superintendent and will be succeeded by Herbert J. Scott, chief engineer. Edmund C. Morgan has been named vice-president and chief chemist. Wesley A. Garr, safety director of employe relations, has been made assistant general superintendent, and Clifford Beck has been appointed general foreman and assistant to the general superintendent.

Harry A. Reichenbach, who will retire October, 1956, has relinquished his active duties as vice-president in charge of production but will remain as engineering consultant and advisor.

Named Superintendent

FRED HANNA has been appointed superintendent of the Wedron Silica Co., Wedron, Ill., according to an announcement by Alfred Gawthorp, president. Formerly assistant superintendent, Mr. Hanna succeeds John A. Dummett, superintendent since 1920, who has retired. Marshall W. Kidd, who has served in a supervisory capacity for many years, succeeds Mr. Hanna as assistant superintendent. A. Warsaw, chairman of the board, has also retired. President of Wedron Silica Co. from 1911 to 1954, he and Mrs. Warsaw are now residing in California.

Public Relations Director

FRANK L. CROSBY has been appointed director of public relations for Kaiser Gypsum Co., Oakland, Calif. He has been handling the company's public relations in the Pacific Northwest for 18 months. Prior to that he was public relations director for Columbia Lumber Co. of Alaska and Alaska Plywood Corp., Juneau. Mr. Crosby attended Seattle University and the University of Washington.

Rotary International Officer

PAUL N. DOLL, manager, Missouri Limestone Producers Association, Jefferson City, Mo., has been appointed an officer of Rotary International, worldwide service club organization, for the 1955-56 fiscal year. Mr. Doll is also executive secretary of the Missouri Society of Professional Engineers, vice-president of the Advisory

Council of the University of Missouri, and past-president of the University of Missouri Alumni Association. He is a past-president of the Missouri-Kansas-Nebraska section of the American Society of Agricultural Engineers, and a past-president of the Rotary Club of Jefferson City, of which he has been a member since 1949.

Re-Elected Board Chairman

ROGER H. CORBETTA, president, Corbetta Construction Co., Inc., New York, N. Y., has been re-elected chairman of the Concrete Industry Board, Inc., of New York City, for the fifth year. William J. McIntosh was re-elected secretary, and Dugald J. Cameron, treasurer. Other members of the board include Fred E. Schilling and H. E. Tear, representing The Cement League; Dugald J. Cameron, Concrete Reinforcing Steel Institute; Joseph Di Stasio, Sr., Structural Engineers Society; M. J. McMillan, Portland Cement Association; M. W. Del Gaudio, Architects Council of New York City; Elliot Haller, testing laboratories; Anthony Pope, ready-mixed concrete suppliers; Emil Praeger, American Society of Civil Engineers, and Frederick S. Merritt, technical press.

Sells Interest in Construction Firm

OLIVER L. LAVOY has sold his interest in LaVoy & Sheffler, Inc., highway contracting firm of Fargo, N. D., to Roy E. Scheffler. Mr. LaVoy plans to devote his time to the Sheyenne Sand and Gravel Co., Valley City and Sheyenne, N. D., in which he is a partner with Vern Hanson and Virgil Berglund. The firm was organized in 1952 and produces materials for concrete.

Re-elected President

EMIL P. FRONK has been re-elected president of Prestressed Concrete, Inc., Roseville, Minn. Other officers include Forrest Bjork, Leonard Soukup and William D. Coffman, vice-presidents; Harry Gustafson, treasurer; Walter J. Kopski, assistant treasurer, Norbert Soukup, secretary; and Earl Brink, assistant secretary.

German Gypsum Association

FRITZ ORTH, Hundelshausen, Germany, has been elected president of the German Gypsum Association, Darmstadt, Germany. Otto Fischer, Neckarzimmern, has been appointed vice-president, and W. H. Fischer, Darmstadt, has been named manager of the association.

Assistant Sales Director

GEORGE C. CARDEN has been promoted to assistant sales director of the Signal Mountain Portland Cement Division, Chattanooga, Tenn., of General Portland Cement Co., Chicago, Ill., according to an announcement by L. B. Godfrey, vice-president and sales director of the division.

District Sales Manager

GEORGE M. STEWART has been named manager of the Richmond, Va., sales district of National Gypsum Co., Buffalo, N. Y., and E. Parker Cumings has been appointed assistant manager. Mr. Stewart joined the company in 1949 and has been assistant manager of the Washington sales district since 1952. Mr. Cumings has served as commodity manager of asbestos sales since 1953. He joined the company in 1948 as a sales trainee.

On Gonzaga University Board

NEAL R. FOSSEEN, president, Washington Brick and Lime Co., Spokane, Wash., has been appointed a member of the Gonzaga University Board of Regents. He is also a trustee of the Spokane Chamber of Commerce and president of the Inland Empire Council of Boy Scouts.

Lone Star Superintendent

GEORGE F. MESSINGER has been appointed superintendent of the Spocari, Ala., plant of Lone Star Cement Corp., New York, N. Y. He has been assistant superintendent of the Nazareth plant since 1950. A graduate of Lehigh University, Bethlehem, Penn., Mr. Messinger has been with Lone Star since 1946, starting as plant engineer.

Named Superintendent

HARRIS ROBERTS has been appointed superintendent of the Alsen, N. Y., plant of North American Cement Corp., New York, N. Y., succeeding Hilton Long, who has been named superintendent of the Howes Cave, N. Y., plant. Mr. Roberts was formerly assistant superintendent at Alsen.

Traffic Manager Retires

GEORGE W. COLE, general traffic manager for Medusa Portland Cement Co., Cleveland, Ohio, has retired after 33 years of service. He will be succeeded by Joseph Torer, Jr., a member of the firm for 31 years, who has been serving as assistant traffic manager.

General Sales Manager

G. N. MOSELEY has been appointed general sales manager of Siporex, Ltd., subsidiary of Dominion Tar and Chemical Co. Ltd., Montreal, Canada. A graduate in architecture from the University of Pennsylvania, Mr. Moseley for the past 19 years has been associated with Alexander Murray & Co., Ltd., as manager of the Montreal branch. He is a director of the Montreal Builder's Exchange.

OBITUARIES

WILLIAM J. STOFFEL, vice-president, treasurer and purchasing agent of Dolese & Shepard Co., Chicago, Ill., died suddenly on December 16 at the age of 70. Mr. Stoffel had been associated with the company for more than 53 years, starting in 1902 as car checker at the old Hawthorne quarry in Chicago. He became successively storekeeper, timekeeper, assistant superintendent and superintendent. He was appointed treasurer in 1929 and vice-president in 1954. Mr. Stoffel had been active in affairs of the National Crushed Stone Association and the National Agricultural Limestone Institute, having held offices in both associations.

GEORGE M. FRIEL, sales manager of The Gene Olsen Corp., Adrian, Mich., died November 29 following a short illness. He was 79 years old and had served the concrete block machinery industry since 1909. Through the years, he was identified as sales manager and in other sales capacities successively with Anchor Concrete Machinery Co., Consolidated Concrete Machinery Co., Besser Manufacturing Co., and Stearns Manufacturing Co., before joining The Gene Olsen Corp.

MISS HELEN MCNAMARA, owner of the Eagle Rock Lime Co., Eagle Rock, Va., and for many years treasurer of the National Lime Association, Washington, D. C., passed away on November 11 after a long illness. Miss McNamara, together with her brother, Jim McNamara, and her nephew, John McGinnis, was actively engaged in the lime business for at least 55 years.

HARRY C. MANNING, retired general superintendent of the Dolese Co., Oklahoma City, Okla., died November 30 at his home at Edmond, Okla. He was 79 years old. A native of Middleton, Wis., Mr. Manning moved to Oklahoma in 1907 and joined the Dolese Co. in 1930. He retired in 1950.

GEORGE A. PARO, plant superintendent, Bedford Hills Concrete Products Corp., Bedford Hills, N. Y., died November 14. He was 60 years of age and had been with the firm since 1925.

CHARLES T. CARREL, owner and operator of the Willoughby Sand and Gravel Co., Willoughby, Ohio, died December 3 after a long illness. He was 63 years of age.

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Texaco Marfak keeps bearings clean, seals out dirt and dust. It won't jar or squeeze out, even under heavy shock loads. And *Texaco Marfak's* tough, moisture-proof film guards against wear and rust. All chassis parts last longer . . . you enjoy high operating efficiency and low maintenance costs.

In wheel bearings use *Texaco Marfak Heavy Duty*. While sealing out dirt and moisture, it seals itself in. That means safer braking and protection that lasts for thousands of extra miles, with no seasonal change required.

If you want *just one lubricant* to handle all chassis, wheel bearing, water pump and other grease lubrication—*Texaco Marfak Heavy Duty Special 2* is the answer. This new, lithium-base member of the famous *Marfak* family pumps easily at low temperatures and lubricates effectively over a wide temperature range. It resists water washing, stands up under the most rugged service.

More than 600 million pounds of Texaco Marfak have been sold.

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A Texaco Lubrication Engineer will gladly recommend the proper lubricants to help you increase efficiency and bring down costs throughout your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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INDUSTRY NEWS

Cover Picture

THIS MONTH'S COVER ILLUSTRATION shows a large capacity sand and gravel dredge operated by Cooley Gravel Co., south of Denver, Colo., which has some unusual features. To improve sand gradation, the plant includes a new type gyradisc crusher and dewatering screws. Electrically heated screens are also employed. There are a total of 15 belt conveyors on the dredge which is of all-steel construction. Before the new plant was built, a pilot plant was set up to test out the new equipment and operating procedure.

Pennsylvania Firms Merge

BINKLEY BROS., INC. AND BRADFORD HILLS QUARRY, INC. have merged under the name of Bradford Hills Quarry, Inc. The firms are said to be two of the largest Eastern Pennsylvania companies producing crushed stone, ready-mixed concrete and agricultural limestone. The merger consolidates the Bradford Hills Quarry operations at Downingtown and Norristown, Penn., with the Binkley plants at Lititz (Lancaster Co.), Oxford (Chester Co.), Newport (Perry Co.), Dry Run (Franklin Co.), and Morgantown (Berks Co.), Penn. The company markets its products in Eastern Pennsylvania, New Jersey, Delaware, Maryland and Virginia. Its main offices are in Lancaster, Penn. The former Binkley Bros., Inc., is operating as Binkley Bros., Inc., Division of Bradford Hills Quarry, Inc.

Tanganyika Cement Plant

THE GOVERNMENT OF TANGANYIKA, East Africa, is inviting bids for the building of a cement plant at Wazo Hill, 13 miles from Dar-es-Salaam, the capital and chief port of Tanganyika. The hill consists of a coral limestone overlain by red soil, which would be the main constituent to be mixed with the limestone. The deposit is estimated at 21,000,000 tons of limestone and almost 5,000,000 tons of red soil. Quarrying rights have been reserved, and will be made available to the successful bidder. Clay is available locally, and water supply is said to be plentiful. Cement is currently being imported into Tanganyika, the total for 1954 being 110,000 tons. Copies of the Report of the Department of Geological Survey on Wazo Hill can be obtained free of charge from the Director of Geological Survey, Dodoma, Tanganyika, or from the Commissioner of Mines, Dar-es-Salaam, Tanganyika.

Opens Sand-Gravel Plant

ROSS CONCRETE & MORTAR CO., Huntington, W. Va., has started production at its recently built sand and gravel plant at Apple Grove, Ohio. The company was awarded a contract to supply 107,000 cu. yd. of concrete for the Kaiser Aluminum & Chemical Corp., plant at Ravenswood, W. Va. A concrete batching unit is being built at the Kaiser plant, with sand and gravel being transported from Apple Grove by barge. The Ross company owns land at Apple Grove which is underlain by an estimated 33 million tons of sand and gravel.

Distributes Stock to 25-yr. Employes

BASIC REFRACTORIES, INC., Cleveland, Ohio, inaugurated a plan in 1953, whereby employes receive 25 shares of the company's common stock upon completing 25 years of service. Each year thereafter one additional share is distributed to every member of the "Quarter Century Club." In 1953, 60 employes became eligible; in 1954, seven reached the 25-year mark; and in 1955, Howard P. Eells, Jr., president of the company, presented stock certificates to four new members in addition to the past group of 67. A total of 255 shares in all were distributed. James Kizer, celebrating his 50th anniversary with the company was presented with 100 shares.

Expands Phosphate Output

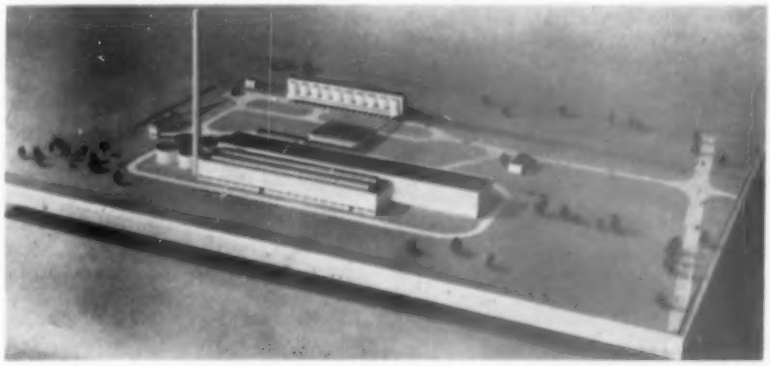
MONTANA PHOSPHATE PRODUCTS CO., is expanding its raw phosphate operations near Garrison, Mont., at a cost of about $1.5 million. The increased production of 400,000 tons of raw phosphate will be sent to processing plants in British Columbia. Northern Pacific Railroad has built a 4.7 mile railroad spur from its main line to the company's mine at Brock Creek. About two-thirds of the finished product is marketed in the United States.

Plans Dolomite Plant

MATERIAL SERVICE CORP., Chicago, Ill., is considering plans for a dolomite mine and processing plant, costing about $2,000,000, west of Great Salt Lake near Delle, Toole County, Utah. The plant would produce refractory materials, and would serve the Intermountain area, Pacific Coast and west Texas steel and copper producing industries.

Double Plant Capacity

ST. LAWRENCE CEMENT CO., Villeneuve, Quebec, Canada, has announced plans to double the capacity of its cement plant being built at Clarkson, 20 miles from Toronto, Ont. This will bring the total output for the company to 4½ million bbl. annually. The ultimate plant layout is for three kilns; and the total plant cost has been esti-



Artist's conception of St. Lawrence Cement Co.'s cement plant being built at Clarkson, near Toronto, Ont., which will have an annual capacity of 3,000,000 bbl. of cement

mated at $27,000,000, for an annual capacity of 3,000,000 bbl. of cement. Production at Clarkson is scheduled to begin January, 1957. Railroad facilities and dock on Lake Ontario will extend the company's natural distribution area beyond Canada.

The plant is designed and engineered by the company's staff: George Schwander, chief mechanical engineer; Herbert Egger, mechanical erection and production manager; Hans Frymann, chief electrical engineer; John Hiltemann, chief building engineer; and Jacques Dubuc, resident engineer.

Turkish Cement Program

THREE OF 21 CEMENT PLANTS, being built in Turkey under a current building program, have been completed and are operating. Of the remaining 18, ten will begin production in 1957, and the other eight in succeeding years. The Turkish Cement Industry Corp., set up with government endorsement and financial backing from Turkish national banks, undertook the large-scale cement plant building project with the cooperation of private enterprise.

Since 1950, cement consumption in Turkey has increased from 317,000 tons to 1,600,000 tons in 1954. Total capacity, previously 395,000 tons, is expected to total 1,800,000 tons by 1956, and 2,800,000 tons by 1960.

Buys Trap Rock Firm

NEW YORK TRAP ROCK CORP., New York, N. Y., has purchased the land, plants and equipment of West Nyack Trap Rock Co., West Nyack, N. Y. George O. Foster, formerly assistant superintendent of the Tomkins Grove plant of New York Trap Rock Corp., has been made superintendent of the West Nyack plant.

Payroll Savings Award

NORTH AMERICAN CEMENT CORP., New York, N. Y., employes have been cited for outstanding participation in the United States Treasury Department's payroll saving plan for the automatic purchase of U. S. Savings Bonds. The citation, signed by Secretary of the Treasury George M. Humphrey, was presented to Perry W. Andreas, executive vice-president. As the result of a recent campaign, company employes increased their participation in the payroll savings plan from 14 percent to 50 percent, with a total of 450 employes buying Savings Bonds regularly on the plan.

Freight Rates Increase

THE INTERSTATE COMMERCE COMMISSION has suspended its tariff rules and rate orders, permitting the nation's railroads to increase freight charges 7 percent, effective February 9, 1956. The railroads have published the proposed rate increases, which are subject to eventual I.C.C. aproval, but did not have to make formal application for the increases as was previously necessary. Formal application procedures would have held the proposed increases up for a year or more.

Limestone Quarry Expansion

WYANDOTTE CHEMICALS CORP., Wyandotte, Mich., recently announced a multi-million dollar modernization and expansion program at its Alpena, Mich., quarry. The work will begin early in 1956, and is scheduled for completion in the Spring of 1957. The quarry produces limestone for the company's chemical manufacturing plants in Wyandotte and the Huron Portland Cement Co.'s mill at Alpena. Plans call for installing new primary and secondary crushers on the quarry floor and a long conveyor leading to the screening plant at the surface. Potential ultimate capacity, stated Robert R. Semple, president, would permit doubling of the quarry's present rate of output .

New Cement Plant

REPUBLIC CEMENT CORP., a recently formed Delaware corporation, has announced plans to build a cement plant at Drake, Ariz., at a cost of about $6,500,000. The plant is expected to have a capacity of 2500 bbl. of portland cement daily.

This recently formed company has obtained control of about 4400 acres of limestone and aluminum silicate deposits on federal land. The main office will be located in Prescott, Ariz., about 29 miles from the plant. Burney C. Prigg is president of the firm; Alvah C. Roebuck, Holton O. Dickson and Sam E. Arbuthnot, vice-presidents; Morris M. Mueller, secretary-treasurer; and Thomas J. Kelley, attorney.

Agricultural Gypsum Plant

POWER GYPSUM AND MANUFACTURING CORP. has begun operations at its agricultural gypsum plant near Lander, Wyo. The company has estimated that gypsum deposits south of Lander contain at least a million tons of gypsum. Mine facilities include a 30-hp. crusher, a 125-hp. hammermill, conveyor and several storage sheds.

Buys Gravel Company

HAYS COUNTY GRAVEL CO., San Marcos, Texas, has purchased Green Valley Gravel Co., Cummings, Texas. The Green Valley plant is continuing its sand and gravel operations, but concrete operations are being handled out of the company's plant north of San Marcos on the Blanco river. The Hays firm ships over 10,000 cu. yd. of gravel per month, and also operates a ready-mixed concrete plant in New Braunfels and a sand and gravel plant in San Antonio, Texas.

Award to Cement Plant

UNIVERSAL ATLAS CEMENT CO.'s Hannibal, Mo., cement plant was honored for the fourth consecutive year by the Associated Industries of Missouri for its program to foster a better understanding of American religious, political and economic freedom. The award, a plaque for the best employe communications program among Missouri companies with under 500 employes, was presented to De Forrest Bailey, assistant to the plant manager. F. A. Hennigan is plant superintendent.

Build Wharf at Gypsum Plant

A WHARF AND A SERIES OF DOLPHINS for mooring the ore ships at Kaiser Gypsum Co.'s recently built Antioch, Calif., gypsum plants, are being constructed by Stolte, Inc., Coulls & Cantor, of Oakland and Alameda, Calif., as announced by Claude E. Harper, vice-president and general manager of Kaiser Gypsum. Design and engineering of the project is being handled by Kaiser Engineers Division. The complete installation, including the dolphins, will be 950 ft. long, and is scheduled for completion by February, 1956.

Dewey Portland Expands

DEWEY PORTLAND CEMENT CO., Kansas City, Mo., has announced that expansion of its cement plant at Linwood, Iowa, is expected to be completed by April, 1956. The program, costing more than $1,000,000, will increase the capacity from 2,750,000 bbl. per year to 3,200,000 bbl. of cement annually. Two cement kilns are being modernized, a 210-ft. stack is being built, and additional grinding and classification equipment installed.

Missouri Limestone Meeting

THE MISSOURI LIMESTONE PRODUCERS ASSOCIATION held its 11th annual meeting December 6-7, 1956, at Jefferson City, Mo., with an attendance of about 250 producers and guests, the largest in the association's history. Robert M. Koch, National Agricultural Limestone Association, described the Washington scene, stating that the "soil bank" program would be a big improvement over the present federal farm program but that it would not heal all ills of the farmer. Prices and economic conditions of the farmers must be improved if they are to purchase limestone in large amounts, ac-

cording to Mr. Koch. He pointed out that 1947 was the biggest agstone year in America when about 33 million tons of agstone were used on farms in the United States. About half that amount will be used in 1955, he said.

John H. Hendren, association counsel discussed transportation tax, percentage depletion, mine inspection tax, truck cover legislation, Public Service Commission truck permission, and the Clinton Court case which was ruled on in 1955 by the Missouri Supreme Court, precluding a county court from selling crushed stone products to the public.

Election of officers was held: Arly H. Brooks, Kahoka, Mo., was named president; Oliver L. Taetz, Gray Summit, vice-president; and Roy E. Mayes, Carthage, secretary-treasurer. Board members to serve three years were elected as follows: L. H. Bray, Bray Construction Co., Maryville; and Frank Snyder, Snyder Quarries, Gallatin. Continuing as board members are: Arly H. Brooks, Roy E. Mayes, Oliver L. Taetz and Earl Thomas, T and O Lime & Rock Co., Sedalia; Ben Lustig, Rock Acres Lime Co., Independence; and H. E. McClain, Wellsville. Also elected to serve during 1956 are: John H. Hendren, association counsel, and Paul N. Doll, Jefferson City, association manager.

Building Cement Plant

HERCULES PORTLAND CEMENT CO., INC., a recently formed corporation of Tulsa, Okla., is building a cement plant north of Locust Grove, Okla. The plant, costing approximately $2,000,000, is scheduled to begin production, at the rate of 1500 bbl. daily, on April 1, 1956. The corporation has mineral leases on a 600 acre limestone deposit, which has been estimated to contain sufficient limestone for 100 years' operation. Hersal Wilkinson is president of the firm, Kenneth Woodruff is vice-president, and Basil Georges is secretary-treasurer.

Pavement Yardage

AWARDS OF CONCRETE PAVEMENT for the month of November, 1955, were listed by the Portland Cement Association as follows:

	Sq. yd. awarded during November, 1955
Roads	3,345,369
Streets and alleys	1,930,502
Airports	1,895,116
Total	7,170,987

Increases Cement Capacity

THE PITTSBURGH COKE & CHEMICAL CO., Pittsburgh, Penn., is expanding its cement plant on Neville Island, at a cost of about $500,000. Plant capacity will be increased by 400,000 bbl. of cement annually, for a total production of more than 2,000,000 bbl. of cement. The company uses slag from its pig iron blast furnaces in the cement production.

South Korean Cement Plant

THE UNITED NATIONS KOREAN RECONSTRUCTION AGENCY is building a cement plant at Mungyong, southeast of Seoul, South Korea. The plant, said to be the largest in this area, is expected to cost about $8,000,000.

Fire at Gravel Plant

WESTERN SAND AND GRAVEL CO., Stouffville, Ontario, Canada, lost an estimated $100,000 worth of sand and gravel processing machinery when a fire broke out in the plant's machinery repair shop. A crusher, three gravel trucks, a conveyor, motors, welders and bins were destroyed. John Byers, Grant Barkey and Fred Mason are co-owners of the company.

To Build Cement Plant

CANADA CEMENT CO., LTD., Toronto, Ont., Canada, is building a cement plant near Woodstock, Ont., at a cost of approximately $10,000,000. The plant will have an initial capacity of 1,500,000 bbl. or 6,000,000 bags of cement, when it is completed in the Fall of 1956. The company is also expanding its Montreal East cement plant.

Coming Conventions

February 13-16, 1956—
National Sand and Gravel Association, 40th Annual Convention and Biennial Show, Conrad Hilton Hotel and Chicago Coliseum, Chicago, Ill.

February 13-16, 1956—
National Ready Mixed Concrete Association, 26th Annual Convention and Biennial Show, Conrad Hilton Hotel and Chicago Coliseum, Chicago, Ill.

February 15-17, 1956—
National Agricultural Limestone Institute, Blackstone Hotel, Chicago, Ill.

February 20-21, 1956—
National Concrete Products Association, Seventh Annual Convention, Prince Edward Hotel, Windsor, Ont.

February 20-22, 1956—
National Crushed Stone Association, 39th Annual Convention and Exposition, Conrad Hilton Hotel, Chicago, Ill.

February 20-23, 1956—
American Concrete Institute, 52nd Annual Convention, Bellevue - Stratford Hotel, Philadelphia, Penn.

February 20-24, 1956—
American Institute of Mining and Metallurgical Engineers, Annual Convention, Hotel Statler, New York, N. Y.

February 22-23, 1956—
Iowa Agricultural Limestone Association, 11th Annual Convention, Savery Hotel, Des Moines, Iowa.

Feb. 27-March 2, 1956—
American Society for Testing Materials, Committee Week, Hotel Statler, Buffalo, N. Y.

March 6-10, 1956—
American Concrete Pipe Association, 48th Annual Meeting, The Broadmoor, Colorado Springs, Colo.

April 12-14, 1956—
American Concrete Agricultural Pipe Association, Sixth Annual Convention, Brown Palace Hotel, Denver, Colo.

HINTS

AND HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Heavy Duty Back Stop

THIS VIEW shows a heavy duty Wonway Clutch back stop mounted on the head pulley of a 60-in. x 182-ft. belt conveyor used at a large midwestern crushed stone plant. Note heavy supporting structural frame connected to the back stop device.

Back stop for 60-in. belt conveyor

Handling Bulk Cement

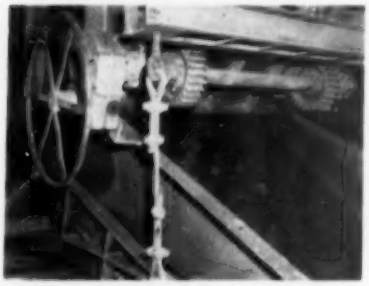
WITH FIVE FULLER-KINYON PUMP LINES operating, 27,000 bbl. of bulk portland cement can be unloaded from shiphold into this big warehouse at Port Everglades, Fla., in 48 hr. The warehouse which is 200-ft. long and 150 ft. wide and built without columns, is owned and operated by Ponce Products, Inc., a subsidiary of Ponce Cement Corp. of Ponce, Puerto Rico. In recent months a shipload of Ponce cement has been received at the warehouse each week. Port Everglades is the ocean port for Ft. Lauderdale, Fla.

According to George W. Kelley, manager of the warehouse, the building has a capacity of 100,000 bbl. From the warehouse, the cement is pumped as needed into a 1500-bbl. silo for loading into bulk cement trucks or railroad cars. Only one minute is required to fill a 120-bbl. capacity truck.

Five cement pumps unload 27,000 bbl. of cement from ship holds into warehouse

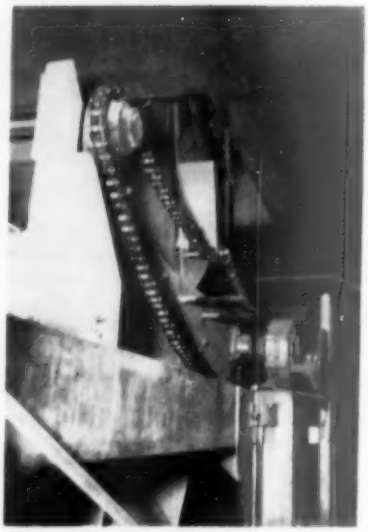
Opening Heavy Gates

THESE TWO VIEWS illustrate how heavy gates are opened manually at a large midwestern crushed stone plant.



Ratchet gear for opening sliding gate under surge bin

In both cases the power is transmitted to the gate by a hand wheel and Dodge Size 5 Torque-arm reducer. In the left view, the rachet-operated sliding gate serves a surge bin over a Syntron electric vibrating feeder. The right view shows the gate-opening device which is mounted on a reclaiming tunnel chute car. The reducer shaft connects to a steel roller chain and sprocket, with the clam-shell gate being attached to the chain. Moving the hand wheel to the right opens the gate.

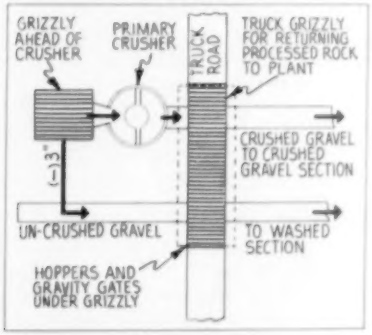


Chain and sprocket for opening clam shell gate in reclaiming tunnel

Truck Grizzly

A PRODUCER OF SAND AND GRAVEL keeps the crushed material separate from the uncrushed. The uncrushed material is washed, screened and the sand is recovered. The crushed product is screened and processed dry.

At a grizzly ahead of the Allis-Chalmers gyratory primary crusher, a split



Grizzly assembly to handle crushed and uncrushed materials

is made, the plus 3-in. going to the crusher and the throughs to an inclined belt conveyor that delivers to the washing plant. The crusher discharges to a separate belt conveyor inclined at the same angle as the first and is parallel to it. Near the toe and over the two belt conveyors, the company has built a bridge or flat rail grizzly with hoppers beneath. Processed rock can be trucked back to this assembly and sent through the plant a second time, if desired. Gravity gates are used on the hoppers under the grizzly.

Screen Hoist

TO FACILITATE REPAIR AND MAINTENANCE of vibrating screens, a midwestern crushed stone producer has

I-beam hoist track mounted over 6- x 14-ft. double-deck screen facilitates repair operations

installed an I-beam hoist track above each screen. Each track is connected to a main hoist track leading to an outrigger in the screen house. This arrangement enables the entire screen frame to be replaced (by chain hoist) very quickly, thereby minimizing down time. The screen shown here is a 6- x 14-ft. Tyler Ty-Rock double-deck unit.

Portable Field Conveyors

A UNIQUE FLEXIBLE FIELD CONVEYOR SYSTEM is employed by Construction Aggregates Corp., Chicago, Ill., at its gravel pit near Ferrysburg, Mich. The system incorporates six 30-in. x 100-ft. portable conveyors in series, followed by a 30-in x 1000-ft. gathering belt conveyor, and at right angles to this, a 30-in. x 200-ft. barge loading conveyor. The two latter units are permanently mounted.

Each portable conveyor is supported on the ground at three points and is inclined to give a discharge height of 6 ft. Each flight is fitted with two

Dragline (minus its 3-cu. yd. bucket) setting a 100-ft. field conveyor at gravel pit

heavy duty lifting bails to facilitate moving by the pit dragline (a Manitowoc 3500 machine carrying a 3-cu. yd. bucket). In conveyor relocation, the dragline bucket is removed and cable slings substituted. An individual conveyor can be relocated in only 30 to 45 minutes.

In actual operation the field hopper and first of the 100-ft conveyors are mounted adjacent to the bank, permitting the dragline to cast directly from pit into the hopper. The system handles about 300 t.p.h.

I-Beam Protected Chutes

DISCARDED I-BEAMS are used for chutes at an eastern crushed stone plant. To prevent spillage, the sides are built up with steel plate. Wear is minimized by welding either old rails, shafting, or bolt stock to the chute bot-

Another I-beam crusher feed chute, with 2-in. shafting welded to the chute bottom

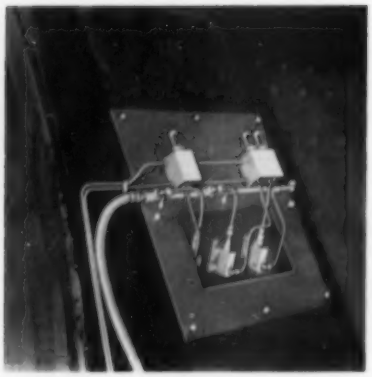
A built-up I-beam chute serving a secondary gyratory crusher (before the chute bottom was lined). A second I-beam chute (to rear) bypasses the crusher

toms. These chutes were used particularly on long spans or for high angle drops.

Sound Absorbers for Heavy Machinery

ACOUSTICAL UNITS constructed as pyramids from perforated aluminum sheets backed with glass fiber wool, developed by United States Gypsum Co., Chicago, Ill., are being used to reduce industrial noise levels injurious to the efficiency and hearing of workers. H. A. Gould of U. S. Gypsum described the "functional sound absorbers" at the recent National Noise Abatement symposium at the Armour Research Foundation of the Illinois Institute of Technology.

NEW MACHINERY

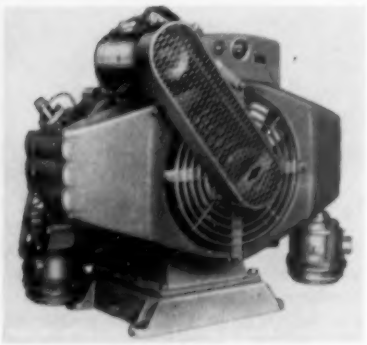


Spray Valve Panel

THE FARVAL CORP., 3249 E. 80th St., Cleveland 4, Ohio, has announced a spray panel for bolting to gear framework or housing. The only piping necessary is the incoming air line connection. The panel can be hinged if desired, in order to inspect the gear teeth. The unit is designed to eliminate downtime for hand oiling, and to save excess oil formerly wasted. It also permits higher speeds and heavier loads through keeping gears well lubricated.

Vibrating Screens

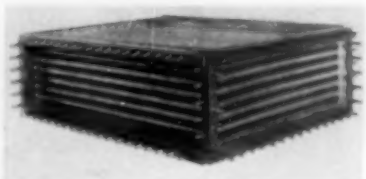
SYNTRON CO., 450 Lexington Ave., Homer City, Penn., has brought out "VSF" "Pulsating Magnet" vibrating screens for high capacity scalping and rough sizing operations. The models are made of a rigid steel frame, replaceable screening surfaces, and are powered by dust sealed electro-magnetic drive, operating from 220 volts, 60 cycle a-c or 440 volt, 60 cycle a-c. They are available in four models with screen dimensions of 18- x 36-in., 24- x 48-in., 36- x 60-in., and 48- x 72-in. Phosphor bronze, stainless steel or high tensile steel woven wire cloth with openings for 20-mesh to ¼-in. are available. Each screen is supplied with a separate electric controller, which can be arranged for wall mounting. A tap switch is incorporated which may be adjusted to control the amplitude of screen vibration.



Air-Cooled Diesel Engine

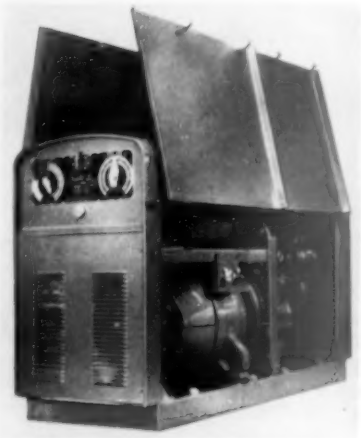
D. W. ONAN & SONS INC., Minneapolis, Minn., has announced the Model DRP, 15-hp. air-cooled diesel engine with opposed two-cylinder design for smooth running operation. The engine has a 3½-in. bore, 3½-in. stroke and a 67.3 cu. in. piston displacement. Compression ratio is 17.3:1 and the unit weighs 516 lb. The crankshaft and connecting rods are of forged steel, with extra large bearing surfaces. Pistons are of vanasil aluminum alloy and the exhaust valves and seats are of Stellite. The unit also has full-pressure lubrication.

The 12-volt battery charging generator and 12-volt electric starter are included as standard equipment, as well as a throttle lever template, timing gauge and instruction manual. Optional accessories include electric glow plugs and intake preheaters for cold weather operation, muffler, fuel tank and crankshaft extension.



Waste Gas Heat Exchanger

THE GRISCOM-RUSSELL CO., Massillon, Ohio, has brought out a heat exchanger with a finned plate design developed for recovery of heat from high temperature waste gases. Designated the G-R Plate-Fin Exchanger, it is designed to withstand gases at pressures up to 100 p.s.i. and temperatures to 1100 deg. F. It is of compact cross-flow design, with an extended surface consisting of corrugations on both the shell and tube sides. An individual cell of the exchanger consists essentially of three simple parts: the corrugated sheets, the formed and butt-welded flat tubes, and the blanked and extruded sheet metal tube sheets. All sealing surfaces are heliarc welded to insure tightness, and all surfaces are covered with a protective nickel-base brazing alloy which also joins the corrugated sheets to the tubes. The brazing alloy and its application technique were developed by the company to resist high temperature oxidation and corrosion from hot combustion products, sea water, and many acids and other chemicals.



Diesel-Powered Welder

THE LINCOLN ELECTRIC CO., Cleveland, Ohio, has announced the "Shield-Arc SAE-250," a diesel-powered welder for construction, pipe line and structural welding. It is rated at 250 amperes at 40 volts, 60 percent continuous duty cycle. It features an improved fuel system of the engine to maintain accurate current output in arc striking and throughout the range of the welder. The arc can be controlled as to type as well as intensity to permit efficient welding in all positions and under varying conditions of field welding. It has a range of 50 to 250 amperes, with weld electrodes

from $\frac{1}{16}$- to ¼-in. dia. The welding generator is equipped with power outlets to provide 115 volt, d-c auxiliary power for operating tools and lights.

Portable Rotary Compressor

WORTHINGTON CORP., Harrison, N. J., has announced the Blue Brute '600' portable rotary compressor featuring an easy-acting clutch permitting the operator to warm up the engine before cutting in the compressor. The compressor is self-draining, eliminating settling of oil and moisture in low areas of either cylinders, inter-stage chamber or discharge point. Additional features include a two-stage oil separator, separate oil reservoir and air tanks, and a shorter wheel base for easier handling on the job.

Truck-Tractor

KENWORTH MOTOR TRUCK CORP., Seattle, Wash., has announced the 802-B earthmover truck-tractor with a semi-trailer dump. The unit is powered by a 300-hp. turbo-charged Cummins NRT-600 diesel engine. In dumping, the entire trailer raises, and the rear trailer wheels move forward to a position directly behind the tractor tires. The fifth wheel is equipped with a ball socket for flexibility in the dumping operation. A special guide and equalizer stabilizes the body when dumping, to eliminate strain or twist on the twin, three-stage telescopic hoist.

Of all-welded steel construction, the unit is braced with box section ribs and has longitudinal reinforcement between the ribs at the body sides. The body is flared at the sides for ease of loading. Another feature is interchangeability of axle outer end parts between the truck and trailer for on-the-job servicing. Parts such as wheels, rims, bearings, brake assemblies and tires may be used either on the tractor or trailer.

Lightweight Sheaves

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., has announced a line of lightweight "Texlite" sheaves for fractional horsepower and light duty industrial drives. The line includes single-groove sheaves in both bushed and bored-to-size construction with "A" section grooving or combination "A-B" grooving.

Portable Washing Plant

UNIVERSAL ENGINEERING CORP., Cedar Rapids, Iowa, has introduced the Model 869 portable washing plant, designed to handle the large capacity of Universal crushing equipment. The plant has a 36-in. diameter, 25-ft. long double-screw, fine material washer with a 6-ft. x 20-ft. three-deck screen. It is claimed to be the largest portable washer of its type.

Rippers

THE RANSOME CORP., 2729 Hunting Park Ave., Philadelphia 29, Penn., has introduced the R-78 and the R-46 ripper designed to fit tractor-bulldozer blades of various makes. The rippers may be used for ripping frozen ground, road shoulders, shale, rock, asphalt and block pavements.

The Model R-46 was specifically designed for Caterpillar 4A, 4S, 6A and 6S blades, and can be adjusted to blades from 27 to 38 in. in height. The R-78 was designed specifically for Caterpillar 6S, 7A, 7S, 8A and 8S blades, and can be adjusted for blades from 35 to 48 in. in height. The Model R-46 will rip to a depth of 6, 10, 14, and 18 in., and the Model R-78 can be adjusted for ripping to a depth of 6, 12, 15, and 18 in.

The rippers also feature a removable ripping tooth and one-man rack and pinion depth adjustment. Multiple units can be mounted in any position on the blade. The ripper has a welded box construction of heavy duty steel.

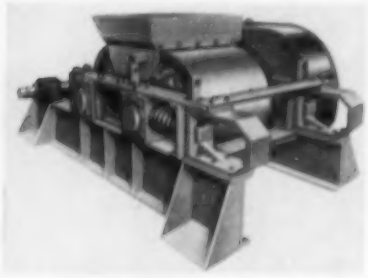
Valve Bag Packers

FULTON BAG & COTTON MILLS., New Orleans, La., has introduced a line of "Ful-Pac" valve bag packing machines, consisting of three basic models: the Economy model, a single spout packer; the Special, a deluxe single spout packer; and, the Dual, a twin spout packer. The models utilize the screw-type principle for movement and delivery of materials to be packed. The units are completely encased in removable steel jackets to provide safety and at the same time protect mechanical parts. Increased packing speed and greater flexibility in bag sizes handled by the machine are also featured.

Explosives Tamping Pole

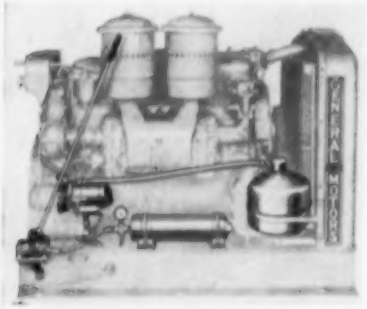
IDEAL EXPLOSIVES SUPPLY CO., 95 Craggy Ave., Asheville, N. C., has brought out an explosives tamping pole with 10-ft. pole sections which may be joined to form a tamping pole adaptable to various depth holes. The

pole may be used in either horizontal or vertical holes. The sections may be joined, by means of special slotted log-chain joints, during insertion and disconnected as they are withdrawn. Pole sections, 1½-in. dia., are hemlock or Douglas fir with joints of non-sparking magnesium-bronze. Any size wooden plug may be attached to the end of the pole. One plug of any desired size is furnished with each set of poles.



Twin Roll Crusher

PIONEER ENGINEERING WORKS, INC., 1515 Central Ave., Minneapolis 13, Minn., has announced a 30 x 24 twin roll crusher which increases production 33⅓ percent over its smaller counterpart, the 30 x 18 unit. Capacity runs up to 254 tons of minus 2¼-in. aggregate per hour, based on material weighing 2700 lb. per cu. yd. Maximum feed size is 4½ - x 4½-in., when using low corrugated rolls. Overall dimensions of the unit are 8-ft. 6-in. long x 6-ft. 10-in. wide, 53½-in. high; weight is 11,200 lb.; power requirements are in the 85 to 105-hp. range.



Hydraulic Starter For Diesels

GENERAL MOTORS CORP., Detroit Diesel Engine Div., Detroit 28, Mich., has developed a hydraulic starting system for diesel engines, which is said to assure split-second starting even under adverse weather conditions. Designated the G.M. Hydrostarter, it is said not to be affected by temperature, humidity or altitude. At the press of a lever, gas pressure built up behind a piston in the accumulator cylinder forces oil through a hydraulic starting motor. When the engine starts, an engine-driven pump forces the oil back into the cylinder, recompressing the gas and the unit is thus automatically recharged for the next start.

Front-Wheel-Drive Loader

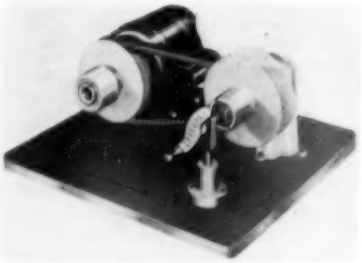
THE FRANK G. HOUGH CO., Libertyville, Ill., has introduced the Model HAH "Payloader," a ¾-cu. yd., two-wheel-drive tractor-shovel with a heaped capacity of 1 cu. yd., a lifting capacity of 4000 lb., and a carrying capacity of 3000 lb. at 4 m.p.h. Especially designed for stockpile work, it has a short turning radius and rear-wheel power steering for fast maneuverability. A high lift of 7 ft. 9 in. facilitates loading trucks or elevated hoppers. Torque-converter-drive and four-speed full-reversing transmission, combined with a gas engine developing 57 hp. are included. Travel speeds range from 0 to 14 m.p.h. in forward and from 0 to 23 m.p.h. in reverse. The bucket arm design permits carrying heaped loads at a lower level, and a hydraulic accumulator is incorporated to absorb load shocks. The unit has a mechanical parking brake which operates off the drive shaft, as well as front-wheel-hydraulic brakes. A sealed and pressurized hydraulic system is incorporated and double-acting rams operate the boom arms and bucket.

Bulk Material Body

BAUGHMAN MANUFACTURING CO., Jerseyville, Ill., has announced the Model SF-5 bulk material body with full hydraulic operation, available in lengths from 10 ft. to 34 ft., truck or trailer mounted, with chain and flight or belt discharge. The full hydraulic operation is controlled from rear-of-body positions. Two control valves are at rear left side of body. One valve controls the speed of the body conveyor and the cross feed auger. The other valve controls the speed of the vertical and discharge augers. A hand operated pump elevates the discharge stack into position, the swing being manually controlled by means of a crank-and-gear arrangement. Designed for fast discharge, the unit can unload up to a ton a minute, depending on the material.

Washer-Classifier

EAGLE IRON WORKS, 137 Holcomb Ave., Des Moines, Iowa, has announced a series of Fine Material Units for washing and classifying concrete aggregate, equipped with welded steel ribbon type screws which have replaceable Ni-Hard shoes on the wearing edges. The flared tub design provides a greater settling pool at the feed-in end of the washer-classifier. Lower bearings are Hydrotex marine-type and are water lubricated under pressure.



Compound Drive Variable Speed Pulley

LOVEJOY FLEXIBLE COUPLING CO., 4949 W. Lake St., Chicago 44, Ill., has added a compound drive to its line of variable speed pulleys, that provides constant belt alignment through its entire speed range up to 8 to 1 ratio. Using a 1750 r.p.m. motor, a speed range of 5550 to 690 is obtained at a rated ¾ hp.; with a 1150 r.p.m. motor, a speed range of 3650 to 454 is provided at a rated ½ hp. The pulleys accommodate the new N.E.M.A.

motor frame shaft sizes and use a 7/8-in. top width or "A" belt as standard. Available in either spring loaded or manually operated design, the pulleys can be mounted on one side or alternate sides in accordance with installation requirements. Manually operated units are equipped with either a pedestal stand or an attachment for a hydraulic yoke. Oil-impregnated bronze bearings are utilized for lifetime lubrication, and parts are machined overall with sliding surfaces precision ground for long life and freeness of operation.

Although the compound drive is designed for installation in new equipment, it can be used to replace less effective units now in use. It is also available in an economy series, using an E1600 pulley and "A" belt to provide a speed range of 4800 to 635 with 1750 r.p.m. motor or 3160 to 418 with 1150 r.p.m. motor. This series accommodates the new N. E. M. A. shaft sizes, but will permit only alternate mounting.

Bituminous Mix Plant

PIONEER ENGINEERING WORKS, INC., Minneapolis, Minn., has introduced a redesigned version of its Model 102 continuous mix bituminous plant. A four-compartment bin provides greater latitude, and flexibility in the composition of aggregate fed to the mixer. On jobs where less than four sizes of aggregate are sufficient, the bin can be converted to production of whatever fewer sizes are needed. Capacity of the continuous process plant ranges up to 200 t.p.h., depending on material conditions.

It has two main units, a combination dryer-dust collector and a combination gradation-mixer, each assembled in a straight line on a single chassis. Standard auxiliary units include a cold aggregate feeder, a hydraulic cradle-mounted conveyor which delivers aggregate to the dryer, a bucket elevator which transfers material from the dryer to the gradation mixing unit, a truck - mounted combustion chamber, and a diesel generator set. All auxiliary units except the generator set and the cold aggregate feeder are mounted on a rubber-tired chassis for towing in line behind the two main units.

Improvements include a totally enclosed belt-type fines return conveyor from the dryer-dust collector unit, replacing a screw type conveyor, and a built-in reject spout to waste fines whenever and to whatever degree desired. A redesigned hot elevator, of steel channel frame and 2-ft. longer is incorporated to accommodate a larger screen. Greater clearance between the center-line of the truck-loading hopper and the back of the mixer unit permits use of wider trucks, and a clearance of 76 in. from the fifth wheel pin on both main units permits use of large tandem truck-tractors in travel. Also available is a wide range of burners, with increased heating and drying capacities. A 400-gal. capacity bitumen tank, and a larger fines feeder with a lower loading point are available as optional equipment.

Truck Shovels

"QUICK-WAY" TRUCK SHOVEL CO., Denver, Colo., has added four truck models and five carrier units to its line for 1956. The truck models include a 5-ton, ¼-cu. yd.; an 8-ton, ⅜-cu. yd.; a 10-ton, ½-cu. yd.; and a 12½-ton, heavy duty ½-cu. yd. unit, all fully convertible with "Quick-Way" attachments.

Engineering features include: power up and down boom as standard equipment on all models; anti-friction bearings on all high-speed, continuous rotating shafts; all chain sprocket drive; heat-hardened hook rollers and roller path; air-cooled clutch and brake drums; positive hydraulic system and clutch controls; forced-feed lubrication, filtered circulation and daily grease fittings centrally located on cab; hinged, fold-out panels all around for ease of adjustment and maintenance; and ventilated, full vision cab.

The carriers are designed with heavy duty specifications and specific capacities for all the new "Quick-Way" units.

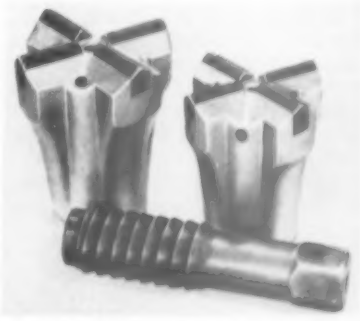
Wire Rope Straightener

CABLE STRATE CO., 345 Arbor Rd., Menlo Park, Calif., has announced a wire rope straightener for removing bends, twists, loops, and kinks from all sizes of cable. There are no fittings or dies to wear out or replace, and the unit is completely portable.

Sectional Belt Conveyors

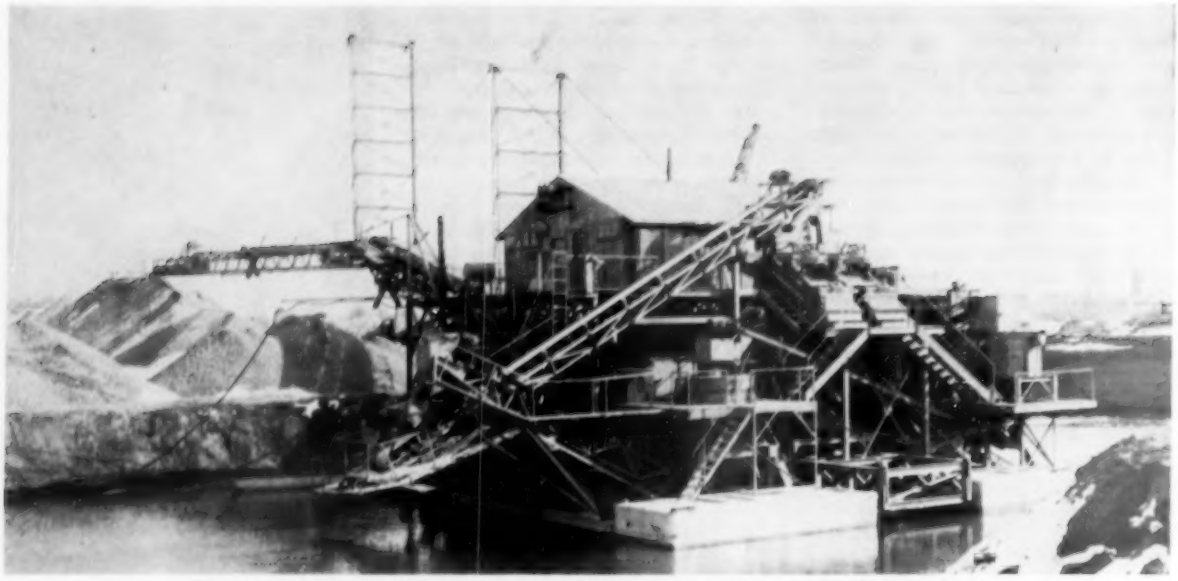
LINK-BELT CO., 307 N. Michigan Ave., Chicago 1, Ill., has announced "Pre-Bilt" sectional belt conveyors in standardized, pre-engineered units with capacities ranging up to 1500 t.p.h. The conveyors feature Series 50 belt idlers, packaged with sectional truss frames and structural steel supporting bents. Belt widths of 18, 24, 30 and 36-in. are available, with 24 and 42 in. deep trusses. Drives range up to 40 hp.

For mounting on various types of supports, such as steel bents, concrete piers, wood cribbing or ties, the conveyors can operate in horizontal and inclined paths. If relocation is required, the conveyor sections may be dismantled and reassembled at the desired location. The conveyors are built in the plant nearest the jobsite, and the components are shop-assembled for ease of installation.



Carbide-Insert Bits

BRUNNER & LAY, INC., 9300 King St., Franklin Park, Ill., has announced the addition of a 600-thread Series to the carbide- insert Rok-Bit line. The bits fit directly on the extension rods, with no need for adapters. Each bit has five air holes — center hole, two other holes on the cutting face and two side holes — to facilitate chip removal and to keep the bit from working in its own cuttings. The "X" design bits (designed to eliminate rifling) are available in 3½-, 3-, 2¾-, and 2½-in. sizes. Where ground conditions are suitable, 2¾- and 3-in. bits are offered in cross design.



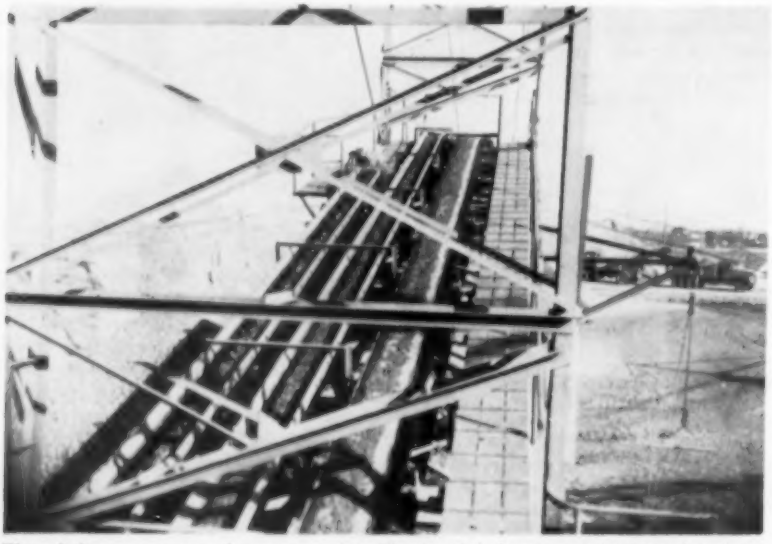
Floating sand and gravel plant showing stockpiling conveyor structure extending to the left

Unusual Sand Preparation Equipment

• Cooley Gravel Co., Denver, Colo., designs compact dredge for high production and low cost operation

By WALTER B. LENHART

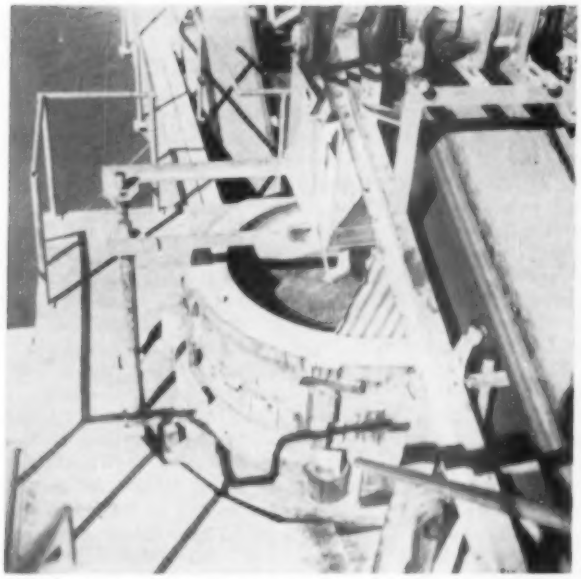
THE NEW FLOATING PLANT of the Cooley Gravel Co., Denver, Colo., is a good example of ingenuity in the production of aggregates, holding down costs and increasing production. The dredge is a high production unit in a small package that is mobile to the n-th degree and which is using new and novel production methods incorporating the latest in operating features. Its design and operation points up the fact that this aggregate producer ranks with the nation's highest in plain over-all efficiency.



Three belt conveyors are shown on stacker. The fourth belt conveyor is below these belts

C. G. Cooley, president of the company, who is pioneering a system of production that is the only one of its kind in the United States, if not in the world, was responsible for the design and construction of this dredge with the assistance of H. Orville Enderud, engineer for the company, and with the Bodinson Manufacturing Co., helping and checking in the final design of this floating gravel plant.

Pioneering is not a new experience for Mr. Cooley. After graduating from Purdue University in 1921 he soon had established sand and gravel plants in Indiana, Louisiana and Missouri. He was the first producer in the United States to install a ball mill type scrubber which was installed in the company's Chillicothe, Mo., plant. The gravel at this plant was so full of mud balls and soft sandstone that it would not go through a Symons cone crusher so he redesigned the oil-seal assembly to permit running a stream of water through the crusher. The redesigning was to prevent the water getting into the oil system. Both these features are still in evidence at the plant after almost 30 years of operation, but due to depletion, this operation is scheduled for early termination.



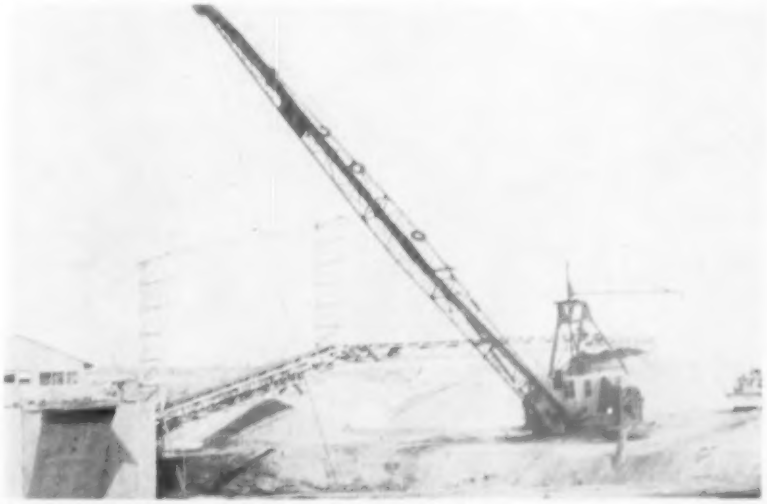
Looking down into 54-in. gyratory type crusher used to manufacture sand

Close-up of one of two 4- x 10-ft. single-deck heated screens

and Heated Screens on Floating Plant

When the depression hit the aggregates industry in the early 1930's, Mr. Cooley and his brother, L. M. Cooley, put his ingenuity to work and soon had two gold dredges in operation, one in Colorado and one in Montana. He and his brother operate the highest (in elevation) coal strip mine in the United States near Steam Boat Springs, Colo. When gold dredging was stopped in 1942, during the World War II period, Mr. Cooley and his brother operated a lead and zinc open pit mine near Joplin, Mo., and in 1951 moved one of the gold dredging units to a site at the north edge of Denver, Colo., and soon his successful "Gravel Gertie I" was in operation. This dredge was described in considerable detail in the March, 1953, issue of ROCK PRODUCTS. In that article, brief mention was also made of an earlier but then inactive plant near Boulder, Colo. The ingenuity of Mr. Cooley at Boulder is worthy of a paragraph for that dredge was installed in a deposit that had the reputation of being below specification quality, the main defect being that the gravel had too high a Los Angeles rattler loss. Several operators in the past had failed on that deposit and the local highway departments looked with extreme disfavor on materials produced from the deposit. The material had a Los Angeles loss above 45 percent. However, Mr. Cooley, being gold-minded, had thoroughly prospected the area. From one opening, he took samples every few feet and panned them for gold as he worked progressively downward to bedrock. From this procedure he learned what had not been suspected, that the last few feet of gravel resting on top of bedrock was a friable, almost decomposed granite. By confining digging operations so as not to include this material, it was possible to produce gravel that had a Los Angeles loss of about 32 percent which was well within specification limits. Incidentally, there was no gold in the decomposed material but enough in the material above to make its recovery worthwhile.

Operations of the company could be further used to point up other important but subordinate features of the gravel industry. The first of these is technological, having to do with the minor problems that must be faced after one major problem is solved. The major problem at the south Den-



Electric walking dragline with 3-cu. yd. bucket. The four rows of aggregate are stacked by the four belt conveyors on stockpiling structure in background

ver site was concerned with the sand. The sand had a bulge in gradation between $\frac{3}{16}$ in. and 16 mesh with insufficient minus 50 and 100 mesh material, which was objectionable and resulted in failure to pass specifications. Such local authorities as the nearby United States Bureau of Reclamation's concrete testing and research laboratory watched the developments with interest. There was not only a bulge in the sand as regards screen size but there was too much volume of the excess size fractions to make it feasible to discard the excess.

Screening Under Water

Due to space limitations on a dredge, Mr. Cooley developed an ingenious rotary-type screen that vibrated, rotated, "oscillated," and finally, screened under water. This screen was intended to take the place of a multiplicity of screens and thus conserve space. We use the term oscillated hesitatingly for this screen introduced a new technique. The screen as developed would revolve, as an illustration, at 5 r.p.m., then speed up to 12 r.p.m., slow to 8 r.p.m. and then speed up again to 24 r.p.m., etc. The trommel was octagonal in cross section and the screen surfaces for each face could be quickly removed and re-installed. After experimenting with this screen, Mr. Cooley built a pilot plant at the south Denver site.

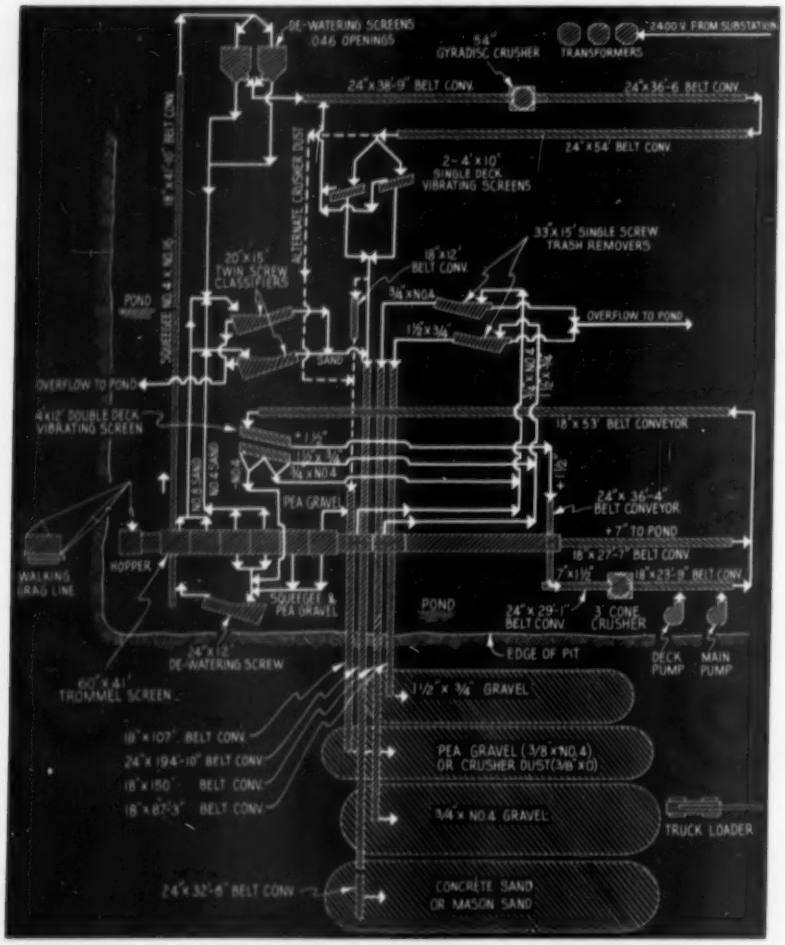
It was a land-based operation with capacity equal to a typical commercial operation but the purpose of the plant was, in essence, to work out all the kinks in the new equipment with the ultimate idea of building a floating plant similar in general design to the north Denver plant. Mr. Cooley used his "trick" screen for some time and it adequately removed the so-called "squegee" sized sand. This is a local term for the "Bird's Eye" sized sand and which was present in objectionable amount. In the experimental plant, it was found that a loose-weave screen cloth mounted as an outer jacket on a conventional rotary screen would do the job with the addition of ball mill or Gyradisc fines. The loose weave permits a certain amount of flexing and practically eliminated blinding. The first experimental screen was therefore abandoned.

The excess sand sizes taken out were found to be too great to throw away and, the sand, while it met specifications, was harsh and lacked workability. This brought up one of the major problems. A ball mill was first used to manufacture sand from the "squegee" sand. By blending the manufactured sand in with current production, the concrete sand had better workability, and less bleeding. The blend met the required specifications and better strengths were obtained. The ball mill was a 6- x 6-ft. Colorado Iron Works unit and it pulverized 10 t.p.h. to minus 30 mesh size. By blending this material with some added squegee it was possible to increase the production of sand 20 t.p.h. However, material still had to be wasted in the minus ¼-in. to No. 16 size range so another "first" was established.

Manufacture Sand

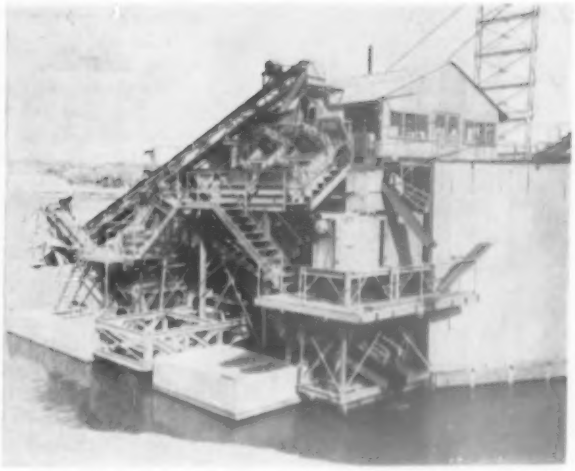
The company installed in the pilot plant a 54-in. Nordberg Gyradisc crusher to manufacture sand from wet "squegee." This was the first installation of its kind west of the Mississippi river. Two installations of the crusher were in use prevously. One was for limestone and the other was used for sand manufacture.

As a preliminary test, Mr. Cooley shipped a carload of his material to the Indianapolis plant of American Aggregates Co. which had a 48-in. Gyradisc crusher in operation for sand manufacture. The limestone company was the Newton County Stone Co., Inc., Kentland, Ind., where a 54-in. machine was in use. After the Indianapolis test, a 54-in. machine was put in operation at the land-based plant at south Denver. The 54-in. Gyradisc has since been installed on the new floating plant along with a 3-ft. standard, extra-coarse, Symons cone crusher. This makes the first floating Gyradisc operation in the world. Operation of the new dredge brought up another problem because with 250 to 275 t.p.h. of feed delivered to the dredge there is an over-production of sand as compared to the coarser sizes. This condition is common to all the operations south of Denver in the South Platte River valley and it is common practice there not to sell gravel unless sand is included. Because of this undesirable sales condition, Mr. Cooley is taking another plunge. This time he is building his third dredge, an old Bodinson dragline type gold dredge, which is Gravel Gertie III, to operate about five miles up-stream from the second dredge on the Platte river in an area where gravel is more in evidence. At the outset the third dredge will pro-



Flowsheet of crushing, screening and classifying equipment on areage and arrangement of stockpiles along bank

A 3-cu. yd. dragline bucket dumping material to hopper ahead of rotary screen on dredge



Gyratory type crusher of new design, to the left, and center, above, may be seen heated screens

duce only one size of gravel (No. 4 to 1½-in.), and the sand will be dumped back to the pond in which the dredge operates.

There were other problems solved at the older land-based plant and the experience gained was incorporated in the second dredge. Elimination of vibration was one problem and this was reduced by mounting the cone crusher on 2-in. thick rubber blocks. The removal of trash and root fragments was another problem and this was overcome by the use of two 33-in. by 15-ft. Eagle de-watering screws. The material fed to the screws is presized and washed. One size is the ¾-in. gravel and the other is 1½-in. size. By having each size go to its separate de-watering screw via a steeply inclined chute that ends near the toe of the settling area, sufficient local turbulence is obtained so as to lift out the wood fragments and they overflow out of the unit. The units discharge to individual side stacker belt conveyors.

Still another problem developed since the feed to the Gyradisc crusher should have a low water content. A 2 percent water content appeared optimum and when the water increased to 3½ percent pancaking and packing occurred, causing a reduction in capacity. This problem was overcome by the installation of two Tyler 4 x 10-ft. heated screens that are operated in conjunction with two, Nordberg, vertical, or so-called Symons "V"-screens. The squegee for feed to the Gyradisc crusher is first de-watered in a small, 24-in. x 12-ft. de-watering screw. This material, via a belt conveyor, goes to the two vertical "V" screens which receive a split feed. The vertical screen is a relatively small unit and has a combined spinning and gyratory motion. Feed is introduced at the top and, due to the spinning action, the gravel is held momentarily against the side of the screen by centrifugal force. Due to the gyratory features, the gravel works progressively downward. The screen here is used essentially as an added de-watering unit and the plus fraction is delivered by belt conveyor

Screen Analyses of Gyradisc, Ball Mill, Finished Concrete Sand, and Finished Masons Sand and Other Pertinent Data
% Passing

Screen Size	Feed to Gyradisc or to the Ball Mill*	Gyradisc Product	-10 Throughs of the Hum-mer Screens	Ball Mill Discharge at 10 t.p.h. on same type of feed material (for comparison)	Pit run sand -¾-in. to which manufactured sand is blended	Sand after blending with -10 Mesh from Gyradisc (concrete)	Sand after blending with ball mill discharge (concrete)	Sand after blending with -10 Mesh from Gyradisc (masons)	Sand after blending with ball mill discharge (masons) (for comparison)	Type of Material Wanted	
										Concrete Sand	Masons Sand
¾	100.0	100.0	100.0	—	—	100.0	100.0	100.0	100.0	100.0	—
No. 4	84.5	92.0	100.0	100.0	100.0	99.0	99.0	100.0	100.0	97.0	100.0
8	42.6	69.0	100.0	99.0	74.5	93.0	88.7	100.0	100.0	90.0	98.5
10	29.7	60.0	99.5	—	—	—	—	—	—	—	—
16	10.2	43.0	90.5	93.0	46.0	70.0	70.0	85.4	92.1	50-85	88.5
30	4.7	28.0	60.5	77.0	27.0	40.6	44.3	52.4	61.1	25-60	64.0
40	—	21.0	50.2	—	—	—	—	—	—	—	—
50	3.4	18.0	37.0	56.0	11.0	18.0	19.6	24.1	26.0	10-30	24.0
80	—	12.0	26.5	—	—	—	—	—	—	—	—
100	2.9	10.0	20.5	36.0	3.2	8.0	7.5	10.4	9.3	2-10	4.0
200	2.0	6.0	11.4	21.0	—	3.0	3.3	5.1	4.5	0-5	—
F.M.	—	3.36	1.96	1.39	3.40	2.70	2.71	2.27	2.11	—	2.29
L.A. Rattler	39-41	—	—	—	—	—	—	—	—	—	—
Percent H_2O	1.98	—	3.1	24	—	—	—	—	—	—	—

Water content of gravel to "V"-screens 16%. Water content of gravel from "V"-screens 2.4%

*Water content of feed is for gyradisc product and not to ball mill.

C. C. Cooley, president of the company, near controls for the heated screens

to the Gyradisc crusher. This gravel from the V-screens sometimes has more water than desired, however, it goes to the gyradisc crusher and the throughs are conveyed to the heated Hum-mer screens. These two heated screen units have .071 in. openings. The throughs from the heated screens carry the excess water and this sand is blended with current production. The plus fraction, having been relieved of its extra water load, is sent back to the gyradisc crusher so that the total feed to the machine is in the 2 percent water range. Current for the heated screens is reduced to 30 cycles from 60 cycle current and the screens vibrate 1800 vibrations per min.

Dredge Operation

The general design of the new dredge is similar in principle to the original one at the north Denver plant. Sized and washed aggregates, as processed on the floating plant, are delivered to the shore areas by individual belt conveyors that are a part of the floating assembly. In the new plant four sizes of material are stockpiled in separate windrows by four belts that are mounted on a boom that extends shoreward from the port side of the boat. (The feed end of the dredge being the bow.) The sizes are: No. 4 to ¾-in.; ¾-in. to 1½-in.; pea gravel, ⅜-in. to No. 4, (or crusher dust — minus ⅜-in. to 0), and concrete sand. Masons sand is also produced but not simultaneously with the concrete sand. Similar to the older operation, the principle of the "Doodle bug" dredge is used; that is, a dragline with a long boom is operated on the shore and it unloads to the hopper on the bow of the boat. The dragline used is a 3-W, Bucyrus Erie, Walking Monighan, electric unit that swings a 3-cu. yd. bucket. It has a 100-ft. boom.

The Gyradisc crusher is set at the closed position, in the ¼-in. to $\frac{3}{16}$-in. range, and ⅝-in. at the top. These clearances were arrived at by the use of a piece of modeling clay inserted between the bowl and the head. The crusher receives a feed of 110 t.p.h. of which approximately 45 percent is returned and has a net production of 61 t.p.h. The unit is powered by a 200-hp. motor and several tests indicate that the horsepower used is in the 125 to 150 range. The feed material has a Los Angeles rattler loss of 39 to 41 percent and is about 87 percent silica which includes silica present as silicates. Liner wear cost for 91,388 tons crushed to minus 10 mesh totaled $1100. The gyradisc sand when blended with current production produces a workable, non-bleeding sand that meets all specifications. Ready-mixed concrete users like it for the sand produces greater compressive strength concrete than normal sand.

The Gyradisc makes an angular product and the feed to it should be uniform and evenly distributed to get maximum efficiency. Feed to the unit is through a rotary head that distributes the material near the periphery of the bowl. The belt carrying the crushed material to the heated screens has a rise of 6 in. per foot. The belt operates at nominal speed and without using a ribbed belt. The success of the belt is due to the sharp, relatively dry, angular product that it carries. Current is delivered to the dredge at 2300 volts and stepped down to 440 for most of the operating units. The gyradisc crusher uses a 2300 volt motor.

The details of the flow of material through the floating plant can be seen in the flow diagram, and the many equipment items on the floating plant and ashore are in the tabulation that is appended. The general flow of material through the plant is as follows: The dragline discharges to the hopper ahead of the rotary screen which is equipped with an outer jacket. Several streams of water are provided in the hopper and these wash the matrix into the rotary unit. The first section is of solid plate and has spiral worms in the drum to help move the material ahead. The two sizes of gravel, "squegee", pea gravel and some sand are removed at the rotary screen. Plus 7-in. gravel drops back into the pond. Minus 7-in., plus 1½-in. gravel goes to the 3-ft. cone crusher which is in closed circuit with a Cedarapids vibrating screen. The upper end of this screen can produce rock dust (or squegee) and the material off the lower end goes with the ¾-in. to 4-mesh gravel. There is not a large amount of oversize in the range going to the Symons cone and the amount of plus 7-in. is just an occasional boulder. The two sizes of gravel go to the Eagle trash removers. Sand is de-watered in two twin Telsmith sand screws after which the sand is stockpiled.

The sand screws are completely covered to prevent foreign material falling into them. They are mounted relatively low in the boat. On the outer end of the long belt for the sand is a shuttle belt that permits a wider windrow of sand to be stocked. The outer end of the sand belt has ribbed return idlers to help remove sand "carryback." Two 2-in. diameter steel cables support the gallery carrying this belt and the other belts. The shuttle is

(Continued on page 72)

OPERATION	EQUIPMENT	MAKE	MODEL NO. SIZE, CAPACITY OR TYPE	POWER SOURCE	POWER TRANSMISSION
FEEDING PLANT	WALKING DRAGLINE	BUCYRUS-MONIGHAN ELECTRIC	3-W WITH 3 CU. YD. BUCYRUS ERIE BUCKET	WESTINGHOUSE 125 H.P. MOTOR-GENERATOR & WARD-LEONARD SYSTEM	
PRIMARY SCREENING	HOPPER TROMMEL SCREEN	BODINSON MFG. CO.	60" DIA. X 44'-0 WITH 82" DIA. X 24'-0 JACKET	30 HP. G.E.-PACIFIC GEARMOTOR	55-1240 CHAIN DRIVE
SAND PREPARATION	SQUEEGEE DE-WATERING SCREW	COOLEY GRAVEL CO.	24"-DIA. X 12"	7½ HP. G.E. IND MOTOR	GATES V-BELT DRIVE
	NO.1 BELT CONVEYOR	CEDARAPIDS	18" X 43'-10" LG.	5 HP. 1160 RPM. LOUIS ALLIS MOTOR	AMERICAN REDUCER V-BELT DRIVE
	DE-WATERING SCREENS	NORDBERG MFG. CO.	SYMONS V-SCREENS WITH 1'-0" ROCK GRID OPENING	5 HP. 1760 R.P.M.	TEX-ROPE DRIVE
	NO.2 BELT CONVEYOR	CEDARAPIDS	24" X 38'-9"	5 HP. 1725 R.P.M. G.E.-PACIFIC GEARMOTOR	CHAIN DRIVE
CRUSHING	CRUSHER	NORDBERG MFG. CO.	54" GYRADISC	200 HP. 1200 RPM WESTINGHOUSE	TEX-ROPE BELTS WESTERN GEAR CO. GEARS
	NO.3 BELT CONVEYOR	COOLEY GRAVEL CO.	24" X 34'-6"	5 HP. 292 RPM. MASTER GEARMOTOR	CHAIN DRIVE
	NO.4 BELT CONVEYOR	COOLEY GRAVEL CO.	24" X 56'-0"	10 HP. 150 RPM. G.E.-PACIFIC GEARMOTOR	CHAIN DRIVE
	HUMMER SCREENS	W.S. TYLER CO.	4'-0" X 10'-0" SINGLE DECK 1½" ROD OIL SPRINGS	V-16 E.V.50 VIBRATORS - ELECTRICALLY HEATED SCREENS	
	TWIN SCREW CLASSIFIER	SMITH ENGINEERING WKS.	20" X 15'-0"	10 HP. 1160 RPM. G.E. MOTOR	GATES V-BELT DRIVES
	NO.14 BELT CONVEYOR	LINK-BELT	18" X 12'-0"	1 HP. U.S. SYNCRO GEAR MOTOR	CHAIN DRIVE
GRAVEL PREPARATION	TRASH REMOVER 3/4" ROCK	EAGLE IRON WORKS	33" X 15'-0" DOUBLE DECK	20 HP. 10 RPM. G.E. MOTOR	LINK-BELT
	TRASH REMOVER 1½" ROCK	" " "	" " "	7 PACIFIC GEAR MOTOR	CHAIN DRIVES
	NO.9 BELT CONVEYOR	COOLEY GRAVEL CO.	24" X 36'-4"	3 HP. 125 RPM. U.S. SYNCRO GEAR	CHAIN DRIVE
	NO.10 BELT CONVEYOR	" " "	24" X 29'-1"	3 HP. 56 RPM. U.S. SYNCRO GEAR	" "
CRUSHING	CRUSHER	NORDBERG MFG. CO.	SYMONS 3' STD. EXTRA COARSE	60 HP. WEST ELECT.	GATES V-BELT DRIVE
	NO.11 BELT CONVEYOR	CEDARAPIDS	18" X 23'-9"	3 HP. 1735 RPM. LOUIS ALLIS MOTOR	AMERICAN RED. & V-BELT DRIVE
	NO.12 BELT CONVEYOR	"	18" X 53'-0"	5 HP. 1160 RPM. LOUIS ALLIS MOTOR	"
	VIBRATING SCREEN	"	4' X 12' DOUBLE DECK	5 HP. 1160 RPM. LOUIS ALLIS MOTORS	GATES V-BELT DRIVE
	NO.13 BELT CONVEYOR	COOLEY GRAVEL CO.	18" X 27'-7"	1 HP. 48 RPM. U.S. SYNCRO GEAR	CHAIN DRIVE
STOCKPILING	NO.8 BELT CONVEYOR	CEDARAPIDS	18" X 107'-0"	5 HP. 1160 RPM. LOUIS ALLIS MOTOR	AMERICAN TYPE & V-BELT DRIVE
	NO.5 BELT CONVEYOR	COOLEY GRAVEL CO.	24" X 194'-0"	15 HP. 112 R.P.M. G.E.-PAC.	CHAIN DRIVE
	NO.6 BELT CONVEYOR	" " "	18" X 150'-0"	10 HP. 235 RPM. U.S. SYNCRO	" "
	NO.7 BELT CONVEYOR	" " "	18" X 87'-3"	5 HP. 292 RPM. MASTER GEARMOTOR	" "
	NO.5-A BELT CONVEYOR	" " "	24" X 32'-6"	5 HP. 565 RPM. WORTHINGTON MOTOR-CLUTCH	" "
WATER SUPPLY	MAIN PUMP	UNITED IRON WORKS	14" D.R.F.	50 HP. 720 RPM. G.E. MOTOR	LINK-BELT V-BELTS & SPROCKETS
	DECK PUMP	" " "	3"	7½ HP. 1745 RPM. G.E. MOTOR	
POWER SUPPLY	TRANSFORMERS	ALLIS-CHALMERS	5-100 KVA 2400/440V		
	POWER CABLE	HAZACORD	TYPE G-SCORD NO2 5000		
SHIPPING	TRUCK LOADER	PETTIBONE MULLIKEN	54-B	CHRYSLER IND-12	

Details of dredge and stockpiling equipment

Finding Heat Expenditure Per Ton Rotary Kiln Lime

By DR. ING. H. EIGEN†

IN LIMEOGRAPHS, January, 1955, lime plant engineers who read German were referred to my article, "The Ideal Rotary Lime Kiln with 70 Percent Thermal Efficiency" which appeared in the October, 1954 issue of "Zement-Kalk-Gips," Wiesbaden, Germany. At the request of the editor of ROCK PRODUCTS, a summary of the article has been prepared for publication in this issue. As it involves complicated calculations to convert metric figures and formulae into the American system, explanations about how the formula for fixing the heat expenditure per kilogram of rotary kiln lime was arrived at, have been eliminated. The formula shows that for each temperature difference occurring between gas and limestone at the boundary of the pre-heating and decalcination zone there exists a corresponding linear equation, according to which the heat expenditure per kilogram of lime is composed of: (a) a basic thermal expenditure; and (b) an additional heat expenditure representing the losses occurring in the decalcination and cooling zone multiplied by the "loss multiplier."

The illustration shows the linear equations for various differences between the gas temperature and the mean temperature of the limestone at the boundary of the pre-heating zone and the hot zone. The abscissa shows the heat loss of the main heat balance comprising the cooling zone and the burning zone; it therefore does not include the pre-heating zone. The heat loss V of the main heat balance includes the following separate items:

(a) The losses (by radiation and convection in B.t.u. per ton of lime) occurring in decalcination and the cooling zone (Kiln tube, not including the pre-heating zone, kiln discharge hood and cooler).

(b) The sensible heat in B.t.u. per ton of lime leaving the cooler.

(c) The heating of aspirated air, entering between the end of the kiln tube and any pre-heater, from atmospheric temperature to 1600 deg. F. in B.t.u. per ton* of lime.

(d) The sensible and the latent heat in the flue dust in B.t.u. per ton of lime.

In the illustration, allowance has been made for 10 percent excess air. The following examples will explain the application:

Example A: A plain rotary kiln with efficient cooler.

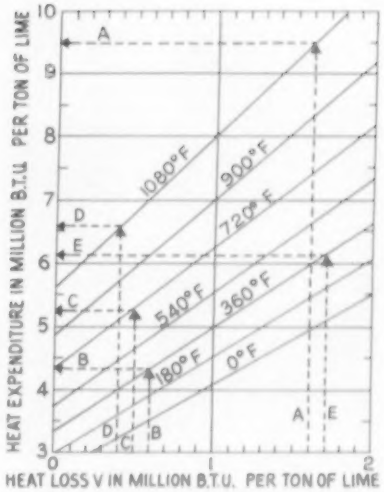
Loss by the main heat balance — B.t.u. 10⁶/Ton

(a) Loss by radiation and convection	1.40
(b) Lime leaving cooler	.10
(c) Heating the aspirated air	.00
(d) Heat in flue dust.	.10
V =	1.60

The temperature difference gas-lime at the boundary of the pre-heating zone and the dissociation zone is 1080 deg. F. because the kiln is perfectly plain. As shown, the heat expenditure is then 9.5 million B.t.u. per ton of lime.

Example B: Kennedy kiln with pre-heater and cooler. The temperature difference, similarly, is 360 deg. F. and the heat loss V, assuming efficient insulation, is only .6 million B.t.u. per ton. The heat expenditure is therefore 4.3 million B.t.u. per ton.

Example C: Rotary kiln by Edgar Allen & Co., Sheffield, England. The kiln is well insulated, the heat loss amounting only to .5 million B.t.u. per ton. A preheater by H. Andrews is provided which effects a mean temperature difference of 720 deg. F. The heat expenditure is 5.25 million B.t.u. per ton of lime, which is therefore considerably less than for the plain kiln in example "A". In the pre-heater by Andrews, the limestone slides down in a bed of uniform thickness on a stationary grate, the hot waste gases being exhausted through the stone. The advantage of this type of preheater, which is used successfully in Europe, is the fact that the hot kiln gases do not contact metal parts since they pass first through the bed of stone and transfer their heat to the stone so that when they pass through the grate they are cool and are harmless to metal parts. Compared with a shaft type, the Andrews' pre-heater is not limited by the size of the inclined grate so rotary kilns of the largest capacities may therefore be equipped with this type of pre-heater. A further advantage is the absence of moving parts inside the chamber subject to wear because the raw stone gravitates on the grate without operational force. The heat expenditure is considerably less than for rotary kilns with cross tiles and without preheater.



Showing linear equations for various differences between the gas temperature and the mean temperature of the limestone at the boundary of the preheating and the hot zone in rotary lime kilns

The above illustration also shows that the minimum heat expenditure can be maintained only if:

(1) the temperature difference between gas and lime at the boundry is low and

(2) the heat loss V is reduced to a minimum.

If only one of these conditions is fulilled, the heat expenditure per ton of lime will be reduced relatively little as shown by examples D and E. Assuming the temperature difference of gas-lime at the boundry is reduced to 180 deg. F. and the heat loss V to .3 million B.t.u. per ton of lime, then the heat expenditure would be only 3.45 million B.t.u. per ton of lime. This, however, would result in a very hot flame and the air for combustion would enter the kiln very highly preheated. In order to prevent the production of hard burnt lime, the lime would have to pass quickly through the hot zone and would enter the cooler with a residual CO_2 content of 5 percent to 10 percent. It would then be necessary either to inject fuel into a soaking pit in order to continue the dissociation or effect a circulation of waste gases in order to reduce the flame temperature in the kiln. But it would be necessary to circulate waste gases of a temperature of 1600 deg. F. because a lower temperature destroys high temperature heat, and increases the heat expenditure per ton of lime.

The loss multiplier depends on the temperature difference between gas and lime at the boundary as shown in the following table:

(Continued on page 84)

*Ton of 2000 lb.
†Remscheid-Lennep, Germany.

Finished materials are stored over a reclaiming tunnel. The minus ¾-in. crusher run base is slurried in short rotary cylinder over silo at end of truck loading bins to the left

TWO-WAY TUNNEL SYSTEM Reclaims Aggregates from Stockpiles

• Marin Rock & Asphalt Co., Novato, Calif., supplies four sizes of stone to bituminous mix plant with one reclaiming tunnel under stockpiles and the other tunnel belt conveyor carries stone to truck loading bins

By WALTER B. LENHART

ONE OF THE NEWEST CRUSHED STONE OPERATIONS in California is the plant of the Marin Rock & Asphalt Co., at Novato, Calif. Novato is in Marin County, about 20 miles north of San Francisco.

The site of the quarry is well up the side of a series of hills, about 1000 yd. from the main highway, U. S. No. 101. The plant operates dry but washing equipment may be installed later. Although the rock is called a basalt, it may be classed more as a rhyolite. It is blue gray in color, hard and tough, and fine grained. A wagon drill does the primary drilling with a 1½-cu. yd. Lima shovel loading to three International trucks that haul the rock downgrade to the primary crusher. The plant has a nominal capacity of 1000 tons per 8 hr. It was designed and built by H. C. Phillips who is the company engineer and also serves as plant manager.

Crushing Operation

The primary crusher is a 30- x 42-in. Birdsboro Buchanan jaw that is fed by an apron feeder. Throughs from the primary, minus 7-in., go over a 3- x 8-ft. Symons rod-deck scalper and a minus ½-in. material is moved by belt conveyor to a waste pile. The plus fraction goes to a surge pile alongside the waste. The surge pile is built over a reclaiming tunnel. A reciprocating feeder and belt conveyor delivers the stone to a Symons screen ahead of a 4-ft. Telsmith gyrasphere reduction crusher with oversize returned by belt conveyor to the belt from the surge pile. In the final reduction section is a 3-ft. Telsmith gyrasphere crusher.

Bituminous plant is fed aggregates by belt conveyor in reclaiming tunnel

Screening

All the screens are Symons and are double-deck units. The screen sizes are 4- x 16-ft., 3- x 12-ft., and a 3- x 10-ft. Six sizes of stone are ground stored. These are normally a 1½-in. to 1-in.; 1- to ¾-in.; ¾- to ½-in.; ½- to ⅜-in.; ⅜- to ¼-in.; and a minus ¼-in. to dust. Under the ground stored material are two, side-by-side, parallel tunnels. One reclaiming belt conveyor runs under all the piles and delivers to the truck loading bins. This tunnel uses gravity type gates. The second tunnel, which extends under the finer sizes of material with the belt conveyor moving in an opposite direction to the other belt, serves a Madsen Iron

Works black top plant. The four sizes of stone going to the asphalt section are fed to the reclaiming belt by feeder belt conveyors driven by vari-speed U. S. motors. Built into this system are automatic controls to provide accurate blending. The tunnels are of concrete construction.

Material going to the truck loading bins can be a blend from any of the 12 gravity gates in the tunnel, or individual sizes may be shipped. All material is weighed at the plant and delivered by trucks as no railroad serves the plant.

At the top and near one end of the truck loading bins, the company recently installed a short mixer drum to prepare a crusher-run, slurried, road base that is mostly a minus ¾-in. material. In the rotary drum, water is sprayed onto the road base at a rate of from 5 to 7 gal. per ton. The material falls to a small steel bin from which it is trucked to place of use while still damp.

The different sizes of stone produced are stockpiled in a straight line by six stacker belts. American and U. S. gear-head motors are used throughout the plant which is of steel and concrete construction, with the exception of the truck loading bins which are of wood. Belts range in width from 36-in. down to 18-in. with the wider belt following the Birdsboro Buchanan primary crusher and this belt rides on Link-Belt idlers. In addition to the reclaiming tunnel system, material can be loaded direct to trucks by a Hough Payloader or a Bay City "20" crane.

The hillside deposit of this company near Novato is of considerable historic interest, for it is said that in the early lush days of the gold rush up to 1000 Chinese workmen made cobblestones that were used to pave the streets of San Francisco from this deposit. Some of the stones were taken up a decade or so ago and were said to have shown very little signs of wear.

To the right is the 30- x 42-in. primary jaw crusher with apron feeder. A 3- x 8-ft. rod-deck scalping screen follows the crusher

Other strips of the cobblestone paving were covered with either concrete or asphalt and as such are still doing service as a foundation material. It is said that the Chinese chipped out the stones by hand, hauled them several miles to the water's edge and from there the cobbles were barged to the docks in San Francisco. Piles of stone chips from these operations are still to be found at the quarry and plant site of the new operation of the Marin Rock & Asphalt Co.

The Marin Rock & Asphalt Co. is owned by Mario Bottini and Frank Brannan with field offices at the plant.

Fertilizer Chemistry

DAVISON CHEMICAL CO., division of W. R. Grace & Co., Baltimore 3, Md., has published a 32-page brochure entitled, "Soils, Phosphates and Fertilizers," by Vincent Sauchelli, company agronomist. The booklet discusses fertilizer chemistry in laymen's terms, giving practical information on the feeding of soils and crops. Also discussed are: kinds of soil; what soils contain moisture supply; water requirements of crops; controlling soil moisture; how plants feed; chemical fertilizers and soil fertility; plant constituents; plant nutrients; humus; commercial fertilizers and soil amendments; secondary and trace elements; use of fertilizers, fertilizer materials, phosphates; and the relative value of phosphatic fertilizers.

Opens Sales Offices

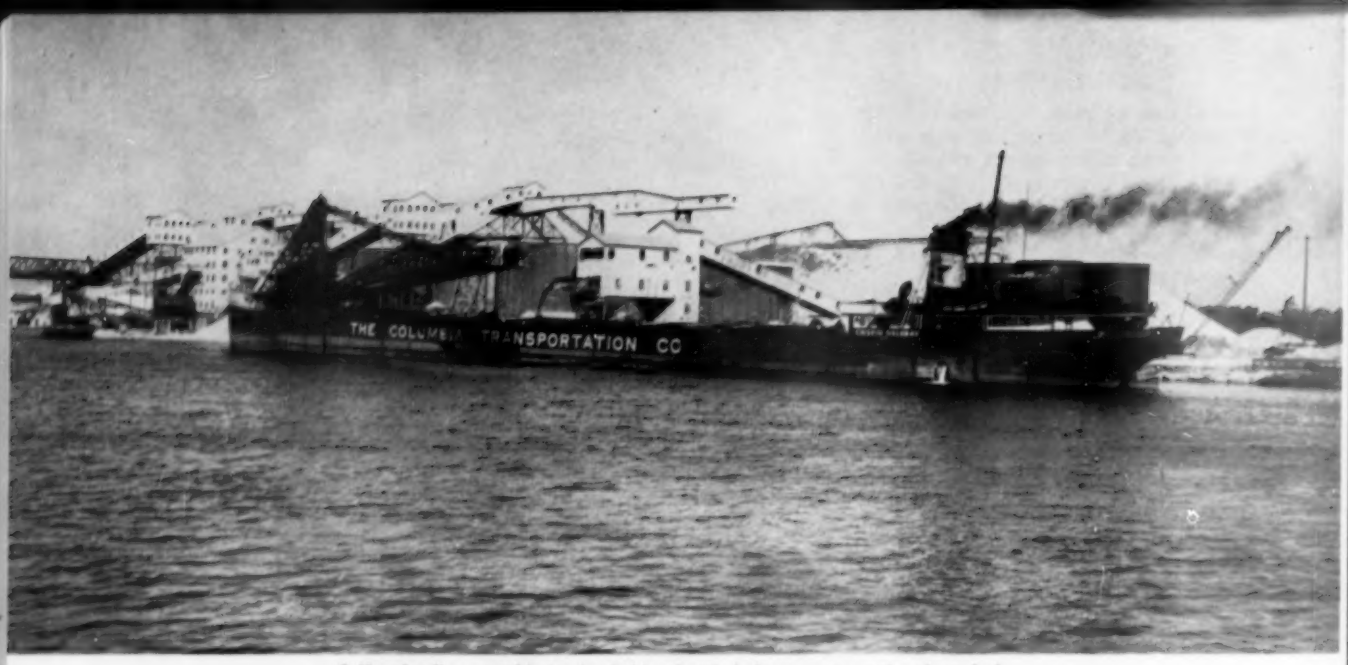
NATIONAL GYPSUM CO., Buffalo, N. Y., is opening a sales office at Richmond, Va., and plans to locate another sales office in Albany, N. Y., to meet the rising volume of business. Melvin H. Baker, chairman of the board, predicts total sales of $150,000,000 for 1955, compared to sales of $126,000,000 in 1954.

Cement Dividend

CONSOLIDATED CEMENT CORP., Chicago, Ill., declared a dividend of 40 cents a share on the company's common stock and a year-end dividend of 50 cents a share, both payable on December 14, 1955, to stockholders of record December 1, 1955.

A 5- x 12-ft. vibrating screen is located above a 4-ft. gyratory type crusher which is the second crushing unit in the plant

Finished materials are produced on this 4- x 16-ft. two-deck vibrating screen with oversize going to the 3-ft. gyratory crusher



Self-unloading vessel being loaded by shuttle belt conveyor at the plant dock

BLEND SIX BASIC SIZES to Meet

• Construction Aggregates Corp., sand and gravel plant at Ferrysburg, Mich., produces 1000 t.p.h. for wide regional market bordering the Great Lakes. Material barged 16 miles to plant; unique portable conveyors in pit

By KENNETH A. GUTSCHICK

FROM THE STANDPOINT OF PLANT LOCATION, market area, and flowsheet, the sand and gravel operation of Construction Aggregates Corp., Ferrysburg, Mich., is one of the most extraordinary in the industry. Located along the navigable Grand River near its junction with Lake Michigan, the plant produces washed aggregates from pit-run gravel and industrial sands from dune sand barged in from separate pits. About three-fourths of the finished products are shipped by self-unloading vessels to a large regional market bordering on the Great Lakes. Low cost water transportation allows concrete aggregates to be shipped as far as Cleveland, Ohio (about 650 miles via water); and special products like foundry sand and additive sand for cement manufacture are shipped as far as Buffalo, N. Y., and even to Lake Ontario ports.

Official personnel at the plant. Left to right: Capt. Wm. Dawes, marine supervisor; Chas. Hammond, master mechanic; J. Vandermoelen, superintendent; C. E. Dull, plant manager; V. A. Brink, vice-president; Wm. Nauta, retired master mechanic; Cliff Wildley, purchasing agent; and Robert Robinson, sales engineer

The plant was built about 25 years ago and subsequently enlarged several times. It has a capacity of 1000 t.p.h. of washed sand and gravel and 300 t.p.h. of washed foundry sand. Annual production, based on a shipping season of nine months, averages 1,750,000 tons. The plant is extremely flexible and turns out as many as 150 graded sizes each year to meet the specifications of the many states, counties, cities, park and sanitary districts, architectural and contracting firms, foundries and steel companies, etc. served in the Great Lakes region.

These products are produced by blending such basic sizes as fine and coarse sand and ⅜-, ¾-, 1¼-, and

Gravel is unloaded at the plant from barges by a 3-cu. yd. clamshell. Boat loading station is in background

150 Specifications

1½-in. gravel in required proportions on a 950-ft. long reclaiming tunnel belt conveyor. Blending is accomplished by self-propelled tunnel cars equipped with four-speed belt feeders which handle from 40 to 1500 t.p.h. depending upon the gate opening and belt speed. Gates and feeders are set according to established formulae for the size gradations desired. Accuracy of the blending system is frequently checked during boat loading by making sieve analyses.

The Ferrysburg plant has separate circuits for processing pit-run gravel and dune sand, and all the basic products are stored in a battery of nine 20,000-ton steel tanks served by the reclaiming tunnel. There is also a separate semi-portable 130-t.p.h. road gravel plant processing the gravel pit overburden, and a separate 95 t.p.h. recrushing circuit working a 500,000-ton former waste pile of ⅜-in. gravel.

Pit Operations

Gravel from a pit along the Bass River (a Grand River tributary) about 16 mi. from the plant is handled by a flexible field belt conveyor system which incorporates six portable 30-in. x 100-ft. conveyors, a 30-in. x 1000-ft. gathering conveyor, and a 30-in. x 200-ft. barge-loading conveyor — all supplied by Barber-Greene. This system was installed in 1953 to meet varying pit conditions. In an earlier worked-out section of the pit, the gravel deposit was 50 ft. thick and extended 15 ft. below the river level; this made it possible to use a barge-mounted diesel crane loading directly into barges. At the present pit site, the deposit is only 30 ft. thick and lies entirely above the water table, thereby necessitating use of dry-pit equipment.

Both the overburden and pit-run gravel are handled (separately) on the field conveyor system, and carried to the Ferrysburg plant by barges coupled in pairs. The overburden, consisting of a rich mixture of clay, sand, and gravel averaging 4 ft. in thickness, is removed by two 18-cu. yd. Heiliner scrapers operated in conjunction with an International TD-24 tractor-bulldozer. This material is stockpiled and later transferred to a receiving hopper mounted over the tail end of the gathering conveyor by a Manitowoc 3500 dragline, which is powered by a Buda diesel engine and fitted with a 3-cu. yd. Hendrix perforated bucket. This same dragline excavates the pit-run gravel, loading into a 25-cu. yd. hopper mounted over the first of the 100-ft. field conveyors.

The conveyors are in series, the last unit discharging to the gathering conveyor, which discharges at right angles to the barge-loading conveyor. Each field conveyor is supported on the ground at three points and is inclined to give a discharge height of 6 ft. Each has two heavy duty lifting bails to facilitate moving by the dragline. For conveyor relocation, the dragline bucket is removed and cable slings substituted. Relocation of at least one of the field conveyors is made daily in a matter of 30 to 45 min. Motor drives for the conveyors are as follows: field units, 7½ hp. each, gathering conveyor 75 hp., and loading conveyor, 25 hp.

The two long conveyors are permanently mounted, the gathering conveyor being supported on wooden trestles paralleling the shore line, and the loading conveyor on steel towers as it extends out to the dock. In the original setup, the gathering conveyor continued outward from the loading conveyor (i.e., at right angles to the shore line), and the field conveyors were worked from the shore inland to the full 1000 ft. length of the conveyor and on both sides. When this initial area was worked out, the system was moved to the present location. When the reserves lying inland from the 1000-ft. conveyor are depleted, the

Receiving hopper and portable field belt conveyors at pit located 16 miles upstream from plant. Conveyor system consists of six portable conveyors, 100-ft. centers, a gathering conveyor in background, and a barge loading conveyor

Testing laboratory where aggregates being loaded into ships and the pit-run materials are checked. Operator is phoning loading instructions to tunnel belt worker

entire system, including the barge-loading conveyor, will be relocated farther upstream.

The pit is operated three 8-hour shifts daily, each shift loading two barges or from 2200-2600 tons, depending upon river conditions. The six barges handling gravel are flat-decked steel units measuring 175- x 40- x 10-ft. While two barges are being loaded, two are in transit, and two are being unloaded at Ferrysburg. In addition, the company operates two 135- x 40-ft. barges on a one-shift basis for hauling the dune sand and the clay-gravel overburden to the plant.

Dune sand is obtained from a 420-acre pit site developed on the leeward side of a 200-ft. high dune ridge located 3000 feet downstream from the plant. The pit operation, started in 1938, is almost identical to that of the gravel pit, consisting of a receiving hopper, three 36-in. x 100-ft. portable field conveyors, a 36-in. x 1000-ft. gathering conveyor, and a 36-in. x 50-ft. cantilevered barge-loading conveyor; all units were company-designed and fabricated. Loading is handled at a 400 t.p.h. rate by a 3-cu. yd. Manitowoc 3500 clamshell. This material is later washed and sized and either sold as core sand and glass sand (bottle sand) or is blended to make specification concrete sand. For the latter product, from 10 to 15 percent is needed to provide the required minus 50-mesh fraction.

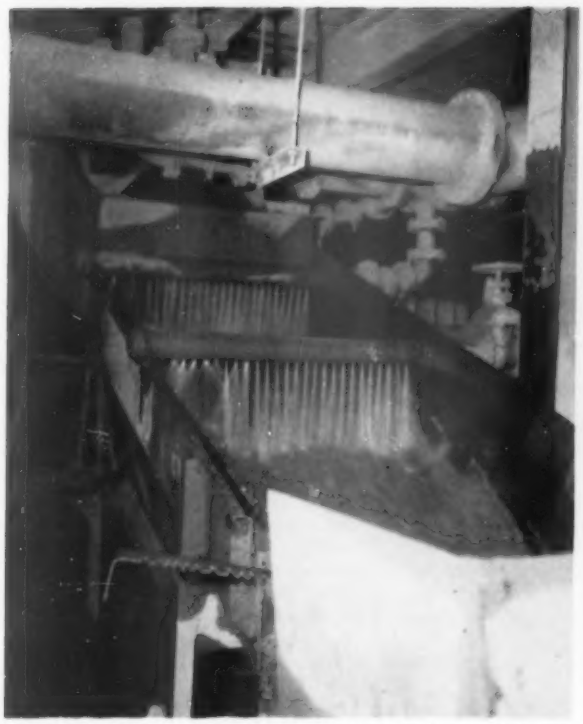
Main Plant

Gravel is unloaded from barges at 400 t.p.h. to a 60-ton yard hopper by a Manitowoc 3500 crane mounting a 3-cu. yd. Owens clamshell bucket. By means of a reciprocating feeder, and 30-in. x 105-ft., 48-in. x 156-ft., and 48-in. x 187-ft. inclined conveyors in series, the material is transferred to a storage tank. Built of heavy steel, this tank has a capacity of 20,000 tons (16,000 tons live). Adjacent to the dock is a company-designed barge unloading machine which is now used only in barge repairing operations.

Material from the surge tank is reclaimed via a rail-mounted feeder car to a 48-in. x 127- ft. tunnel belt conveyor, followed by 48- x 184-ft. and 48- x 102-ft. inclined conveyors in series, which lead to the top of the screening plant. A Merrick Weightometer installed on the 184-ft. conveyor totalizes material fed to the plant. The gravel is initially wetted in a pair of 4-ft. rinsing chutes and fed to a battery of eight 4- x 8-ft. double-deck washing screens of Huron and Hewitt-Robins manufacture. Normally the deck openings are ¾ and ⅜ in., square mesh, respectively. Oversize is fed to a 5- x 10-ft. Hewitt-Robins Eliptex double-deck scalping screen. ¾-in. gravel goes to storage, and the bottom deck throughs are fed to a battery of eight 4- x 8-ft. double-deck Link-Belt screens located on the floor below. The scalping screen is in closed circuit with a 10- x 16-in. Wheeling jaw crusher and a 30- x 22-in. Pioneer double roll crusher, the former handling plus 2-in. gravel and the latter 2 to 1½-in. gravel. A 70-ft. bucket

Group of 24-in. gravel belt conveyors housed in inclined conveyor gallery projecting from screen house

One of five rail-mounted variable-speed belt feeders discharging sand to 48-in. tunnel belt conveyor



Gravel is initially wetted in 4 ft. wide rinsing chute and fed to first screen battery

One of four 4- x 12-ft. screens used to wash gravel before loading boat

elevator returns both crusher products to the top floor screen battery. Minus 1½-in. gravel from the scalping screen is fed to a twin Eagle log washer, which eliminates about 80 percent of the soft particles and clay lumps from this material. Before the log washer was installed, the company used four or five men as pickers; presently only one picker is required (at the scalping screen). The minus 1½-in. gravel is later separated to 1½- to 1¼-in., and 1¼- to ¾-in. on a 4- x 8-ft. Hewitt-Robins screen and put in storage.

Presently only the top decks of the Link-Belt screens are being used, having .228-in. square openings. Pea gravel over the top deck goes to storage, while the throughs discharge to a battery of four 15-ft. dia. Link-Belt Rotoscoops which further wash, classify, and dewater the sand.

Individual but similar conveyor systems transfer the gravel and sand products to the long overhead gallery serving the nine storage tanks. Tanks No. 1-4 are used for gravel and No. 5-9 for sand.

The gravel belt conveyor system consists of four paralleling 24-in. conveyors housed in a 280-ft. long inclined gallery leading from the screen house to a junction house, followed at right angles by a 110-ft. long inclined gallery leading to a transfer tower serving the overhead gallery. (One of the 24-in. conveyors in series serves as a spare). The overhead gallery houses double-deck 24-in. conveyors, with 43-ft. flights serving Tank No. 4 (¾-in.) and Tank No. 3 (⅜-in.) and 126-ft. flights serving Tank No. 5 (presently this conveyor is not being used) and Tanks Nos. 1 and 2. The latter conveyor leads to the 4- x 8-ft. screen mentioned earlier, which discharges 1¼-in. gravel directly to Tank No. 2 and 1½-in. gravel to a 24-in. conveyor serving Tank No. 1.

The sand conveyor system is housed in a 432-ft. long inclined gallery leading from the foundry sand plant (ground level) to a junction house, followed by a 110-ft. inclined gallery at right angles leading to a transfer tower serving the overhead gallery. A pair of 30-in. x 327-ft. inclined conveyors deliver coarse sand from the screen house to the first inclined gallery. Four parallel 32-in. belt conveyors deliver the sand to the double-deck

Two 12-ft. dia. rotating, scoop-type classifiers in foundry sand department

conveyors of the overhead gallery. Tank Nos. 7 and 8 are fed by 43-ft. conveyors, Nos. 9 and 6 by 126-ft. conveyors, and No. 5 by an extension of the 126-ft. flight. Generally, Tanks No. 7 to 9 contain concrete sand and 5 and 6, foundry sand. The sand conveyors have 17 deg. inclines and the belts are operated at extremely high speeds (700 f.p.m.) in order to handle the wet material.

Foundry Sand Plant

Dune sand is unloaded by clamshell from barges to a plant hopper, and delivered by a 30-in. x 293-ft. inclined belt conveyor to a pair of 4- x 10-ft. Link-Belt single-deck rinsing screens. Fitted with wire cloth having 8-mesh openings, the screens scalp off plant roots and other vegetation. Further washing and dewatering takes place in a battery of four 12-ft. dia. Link-Belt Rotoscoops, each having a capacity of 75 t.p.h.; these discharge the finished product to the 433-ft. conveyor mentioned earlier. This system permits the production of a clean, uniformly high grade foundry sand. A typical grain size analysis of the finished core sand product is as follows:

Passing	Retained	Percent
No. 6 Mesh	No. 12 Mesh	0
12	20	0.10
20	30	.55
30	40	5.00
40	50	31.45
50	70	44.45
70	100	18.05
100	140	.50
140	200	.05
200	270	0
270	Pan	0

A.F.A. Fineness 49.5

Blending-Loading Operation

Basic sand and gravel sizes from storage are reclaimed on a 48-in. by 950-ft. tunnel belt conveyor via five variable speed 48-in. belt feeders mounted on self-propelled tunnel cars. The belt is driven at 650 f.p.m. by a 250-hp. motor. Each tank is drawn from through three or five sliding gates opened by a ratchet operated from the car. In blending, from two to five tanks can be tapped simultaneously; and for loading one size, generally two feeders are used under one tank. Each belt feeder has four speeds, based upon two motor and two gear changes. From 40 to 1500 t.p.h. can be handled by each feeder, depending on the belt speed and gate opening (which ranges up to 14 in. wide). Based upon years of operating experience, the company has established a table giving gate openings and feeder speeds for any blended product desired. Originally twelve belt speeds were used, but found to be unnecessary.

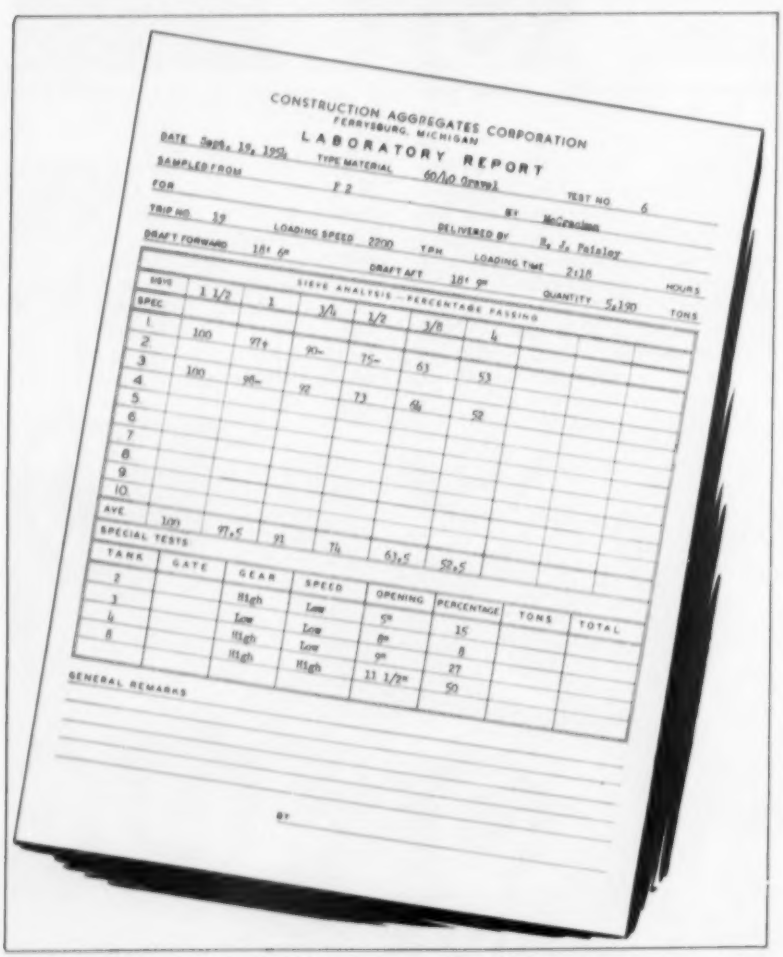
Blended gravel products are split to a battery of four 4- x 12-ft. Simplicity double-deck rinsing screens. These screens have decks with ¾ in. and ¼ in. openings, and discharge to a 48-in. x 262-ft. inclined belt conveyor leading to the boat-loading house, where all shipments are weighed by a Merrick Weightometer. A 48-in. x 83-ft. shuttle belt conveyor is used for boat loading; this conveyor can also shuttle inland from the dock to load trucks or build a stockpile. The shuttle conveyor belt—a Goodrich cord belt—incidentally has been operating since 1946, handling over 15,000,000 tons of material.

The boat loading capacity varies from 1800 t.p.h. for gravel to 2400 t.p.h. for sand. In one 24-hr. period the company loaded a record total of 37,000 tons in four boats. Deliveries are made in contract self-unloading vessels carrying from 5000 to 15,000 tons each. The majority of deliveries are made to Lake Michigan ports, with lesser amounts going to Detroit, Toledo, Cleveland, Buffalo, and other Great Lakes centers. Shipments to the more distant ports are generally made only if there is a return payload. For example, an interesting triangle trade pattern has been developed recently involving the shipment of sand and gravel to Lake Erie ports, coal to Lake Superior ports, and ore pellets to South Chicago, with the boat running light the short distance from South Chicago to Ferrysburg.

The company maintains a well-equipped testing laboratory at Ferrysburg for performing sieve analysis tests during boat loading; shovel cross-section samples are taken from the boat loading conveyor for this purpose. Other physical tests (moisture, deleterious materials, etc.) are also performed regularly, both on the finished products and bank-run material.

Special Recrushing Circuit

In 1951, the company set up a recrushing plant to produce minus ¼-in. asphalt gravel and gravel for concrete block from a 500,000-ton "waste" pile of ⅜-in. material which had accumulated since the plant began operating.



CONSTRUCTION AGGREGATES CORPORATION
FERRYSBURG, MICHIGAN
LABORATORY REPORT

DATE Sept. 19, 1955 TYPE MATERIAL 60/40 Gravel TEST NO. 6
SAMPLED FROM F 2 BY McCracken
FOR DELIVERED BY R. J. Paisley
TRIP NO. 19 LOADING SPEED 2200 T.P.H. LOADING TIME 2:18 HOURS
DRAFT FORWARD 18' 6" DRAFT AFT 18' 9" QUANTITY 5,190 TONS

SIEVE ANALYSIS—PERCENTAGE PASSING

HOLE SPEC.	1 1/2	1	3/4	1/2	3/8	4			
1									
2	100	97+	90-						
3				75-	63	53			
4	100	96-	92						
5				73	64	52			
6									
7									
8									
9									
10									
AVE	100	97.5	91	74	63.5	52.5			

SPECIAL TESTS

TANK	GATE	GEAR	SPEED	OPENING	PERCENTAGE	TONS	TOTAL
2		High	Low	5"	15		
3		Low	Low	8"	8		
4		High	Low	9"	27		
8		High	High	11 1/2"	50		

GENERAL REMARKS

BY

Typical boat loading report for 60/40 gravel, made by blending four basic sizes. Report gives sieve analyses of two samples and respective belt feeder gear and belt speed settings and gate openings

INCREASING FOOTAGE OF DIAMOND CORE DRILLS

with Stoody Acetylene Tube Borium

When we think of diamond studded tools, hard-facing seems unnecessary... after all, the diamond is nature's hardest, most wear resistant substance. Although core bits and their connecting reamers are set with industrial diamonds for extending overall life, the barrels and flutes don't benefit by these inserts. Here's how one operator increased footage of sampling drills from 400 or 500 feet to between 2000 and 3000 feet.

After making comparative tests of several hard-facing materials, 30-40 Acetylene Tube Borium (containing tungsten carbide particles) was selected because of its excellent wear resistance. Reamer bodies were hard-faced with a series of parallel longitudinal beads, the deposits extending around those areas containing the diamond inserts.

Since walls of the core barrels are thinner at each end because of internal threads, wear weakens these areas quicker than the remaining barrel. By hard-facing back 6" from each end and adding extra protection over the threaded areas overall barrel life is equalized. When the hard metal is gone the entire barrel has delivered maximum service. Flutes, attaching core barrels to drill rods, are hard-faced on outside diameters.

Straight edge of saw blade shows how hard-faced end of barrel has held its size.

Stoody Hard-Facing Alloys afford maximum protection to all wearing equipment. For recommended alloys and application technique on your specific wear problems refer to the Stoody Hard-Facing Guidebook. Your Stoody dealer has a copy for you or write direct.

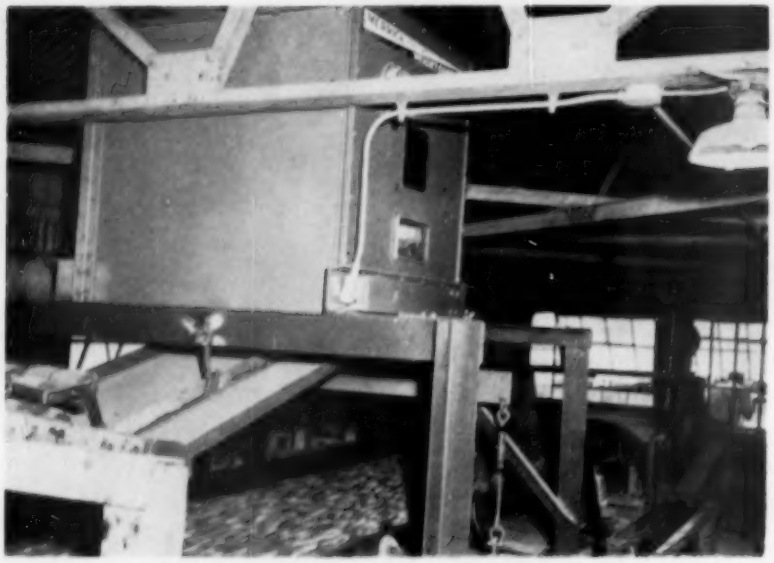
Notice how hard-facing beads surround but do not cover diamond inserts.

STOODY COMPANY

11929 East Slauson Avenue

Whittier, California

See the STOODY EXHIBIT—WELDING SHOW, Buffalo, N. Y., May 9-11



Belt conveyor scale used to weigh all boat shipments

In some years as much as 125,000 tons of this size had been stockpiled.

The gravel is delivered to stockpile from the storage tank by a two-stage 24-in. belt conveyor, and reclaimed on a 24-in. x 140-ft. belt conveyor (housed partly in a 7-ft. dia. x 80-ft. Armco tunnel) to a 40-ton crusher bin. The crusher is a Pioneer 4022 double roll driven by a 75-hp. motor; it produces minus ¼-in. material at 90 t.p.h. This material is delivered on a 24-in. x 120-ft. belt conveyor to a 40-ton bin, from which it can be either taken by belt conveyor to a stockpile (and returned to the main plant) or else be fed directly to a 4- x 8-ft. Simplicity double-deck rinsing screen. Only one deck is used, producing bird's eye gravel (plus 8-mesh), which is taken by a 24-in. x 75-ft. belt conveyor to a truck bin. The waste material—comprising about 20 percent of the crusher product—is discharged to a settling basin and later reclaimed by clamshell for fill sand.

Selection of the roll crusher was based on the extreme hardness of the gravel (which is composed largely of igneous rock and limestone), and on maintaining a uniform feed by dropping the material from the conical-bottom hopper across the live roll face. Roll wear has been minimized by removal of the crusher star gear. The company has also developed a portable grinder which enables the rolls to be resurfaced without dismantling the crusher.

Road Gravel Plant

The road gravel plant is a portable Diamond crushing and screening unit permanently mounted along the dock. It produces 130 t.p.h. of minus ¾-in. material. Gravel overburden from the pit is unloaded from barges by a Manitowoc 3000 crane into a plant hopper, and fed by belt conveyor to the plant. Main equipment includes a 5- x 14-ft. double-deck screen operated in closed circuit with a 15- x 22-in. jaw crusher handling the oversize, and a 22- x 40-in. double-roll crusher handling the bottom deck rejects. The finished material is taken by belt conveyor to a yard hopper for truck loading. This bin is fitted with an electric vibrator which automatically operates when the bin gate is opened.

To handle the local truck and rail market, the company maintains about a dozen stockpiles and adjacent truck hoppers. These materials are generally loaded on barges and unloaded by clamshell either to stockpile or yard hopper. Self-unloading vessels are also used occasionally. In addition, material can be drawn off from certain storage tanks by belt conveyors and fed to yard bins; these conveyors are started and stopped by opening and closing the bin gate.

Double-roll crusher for recrushing ⅜-in. gravel. Material is gravity-fed from hopper

Wash water used in the main plant is supplied at 7500 g.p.m. by a Manistee Iron Works centrifugal pump having a 24-in. suction and 16-in. discharge. The core sand plant is served by a Manistee 8-in. pump delivering 2000 g.p.m. Tailings from both plants are piped to a settling basin in back of the plant, and recovered by clamshell for fill sand, the clear water being returned to the Grand River. Two American Well Works 6-in. pumps deliver 2200 g.p.m. to the rinsing screens at the boat loading station. Waste material is recovered for fill from a settling basin adjacent to the rinse house.

Construction Aggregates Corp., with headquarters in Chicago, Ill., is also a large dredging firm, having undertaken mammoth dredging projects in Chicago, New Jersey, and Venezuela. At present the company is engaged in a dredging project which entails the removal of 180,000,000 cu. yd. of overburden at Steep Rock Lake, Ont. Officers are J. R. Sensibar, president; Ezra Sensibar, Roy A. Brinkman, and V. A. Brink, vice-presidents; E. P. Florsheim, secretary; E. A. Lindsey, treasurer; and Gilbert Rocke, chief engineer.

Main personnel at the Ferrysburg plant are C. E. Dull, plant manager; J. Vandermoelen, plant superintendent; Chas. Hammond, master mechanic; Capt. Wm. Dawes, marine supervisor; Cliff. Wildley, purchasing agent; Robert Robinson, sales engineer; and R. J. McCracken, laboratory testing engineer.

Adds Cement Storage Silos

CALAVERAS CEMENT CO., San Francisco, Calif., has added eight cement storage silos at its San Andreas, Calif., cement plant, at an approximate cost of $325,000. The silos are 112 ft. high, and 36 ft. in diameter. The installation, part of a $4,000,000 expansion program, more than doubles the company's storage capacity.

Hope to Abolish Tariff

AN EFFORT TO HAVE THE 20 PERCENT IMPORT TARIFF on U. S. cement abolished is being made by Manitoba contractors to the provincial government in Ottawa. The group claims that the tariff is unnecessary since Canadian plants, even at capacity production, are unable to meet domestic needs.

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EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

SLAG Producers Discuss Research Program

• National Slag Association annual meeting urges early consideration by Congress of an adequate program of national highway construction. Developing new markets for slag

THE 38TH ANNUAL MEETING of the National Slag Association was held at the Grand Hotel, Point Clear, Ala., on October 27 and 28, 1955. From the standpoint of attendance, business transacted, and social enjoyment, it was one of the best meetings the association ever held.

The first morning was devoted to meetings of the special and standing committees, including advertising and publicity, nominations, budget and finance, and resolutions. At this time special assignments and other important matters were discussed. The board meeting was held in the afternoon, and reports were presented by the director of research, managing director, treasurer, and committee chairmen.

Association research projects undertaken during the year were discussed by Fred Hubbard, director of research. The more important projects include:

(a) An investigation to determine the California Bearing Ratio of slag when used as a granular material. Notwithstanding the fact that the CBR is primarily a soils test, actual values as derived from slag had never been determined. As a result of this investigation, it was found that with slag, CBR values ranging from 150 to 165 can readily be obtained when tested in accordance with the prescribed procedure. A complete report, designated N.S.A. 155-7A, has been circulated to the directors.

(b) Currently underway is a rather extensive investigation concerning the effects of air entrainment and types of aggregates on the flexural and compressive strengths of concrete. Slag, gravel and crushed stone aggregates are involved. Cylinders and beams will be tested at 7, 14, 28 and 90 days. It is planned to issue a final report early in 1956.

Mention was also made of the use of slag aggregate in bituminous concrete for resurfacing on the Pennsylvania Turnpike, wherein slag was specified to provide high non-skid properties. Mr. Hubbard also pointed out that slag was used extensively on the recently-completed Ohio Turnpike — in the construction of 63 miles of 10-in. concrete pavement, various concrete structures (for 65 miles), bituminous penetration macadam shoulders (83 miles), and granulated slag subbase under concrete and base for penetration macadam shoulders (24 miles). The amount supplied was approximately, as follows:

Material	Tons
Concrete aggregate	565,000
Macadam aggregate for shoulders	250,000
Granulated slag	665,000
Bank slag	160,000
Total	1,440,000

E. W. Bauman, managing director, discussed important association activities that occurred during the past year. He stated that the association has already distributed 12,500 copies of the N.S.A. Concrete Tables and 9500 copies of the N.S.A. Bituminous Mix Tables. These publications were reported to be well received by engineers, contractors and architects. The association also developed a Slag Catalog for Sweet's Service; and on the basis of its wide acceptance, it was decided that the Catalog would again be carried in the next issue of Sweet's.

The speaker also reported that participation in the safety competition of the slag industry, sponsored by the association and directed by the U. S. Bureau of Mines, remains very active and is going into its seventh year with more member companies enrolled than ever before.

Other items referred to by Mr. Bauman concerned N.S.A.-sponsored meetings, technical society activities, the N.S.A. exhibit, slag statistics, and special association activities. Four new members were added during 1955.

Among the many resolutions adopted at the meeting was one pertaining to the all important problem of getting an adequate national highway program underway at the earliest date. In this resolution, the association joined with the A.R.B.A. and the A.A.S.H.O. in endorsing an extensive and sound Program of Highway Construction. A copy of the N.S.A. resolution will be sent to the congressional committees

(Continued on page 72)

R. O. Dierker, president, Duquense Slag Products Co., re-elected president of National Slag Association

R. K. Plumb, association vice-president (left), and **E. W. Bauman,** managing director, awaiting the boat which carried the party to Mobile, Ala.

C. W. Ireland, (right), Birmingham Slag Co., and **Irving Warner, Jr.,** (left foreground), Warner Co., inspecting concrete pipe made by Cen-Vi-Ro Corp., Mobile, Ala.

KENNEDY Machinery & Equipment handles BIGGER jobs at LOWER cost!

these are typical KVS installations . . . they prove their worth—day after day right on the job . . .

The Kennedy CUBER SENIOR Crushers photographed *on the job* present a *new,* multi-stage, regulated flow impact breaker for primary and secondary crushing. Dual rotor . . . triple action . . . available in portable or stationary models.

This KVS designed Crusher offers the definite advantage of "on the job" use and permits the preparation of aggregates, mile by mile, to reduce costly trucking and to speed up construction. Handles any non-abrasive stone and similar quarry rock that will freely pass the 36″ x 48″ feed opening.

The only moving parts in Cuber Senior are two identical rotors equipped with cast Manganese steel hammers. Discharge grates reject over-size rock back to the hammers. Grate adjustments control top size of finished material. Variable speed operation produces wide range of aggregate sizes with *full gradation control.*

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FORD EXPERIENCE IN HEAVY DUTY ENGINES PAYS OFF . . .

- **Much longer peak engine performance!**
- **Much less DOWN TIME on the job!**

Ford Trucks for '56 save you money right from the start. And, they keep on saving with their extra-sturdy, long-life engine design.

For instance . . . Ford Engineers have now introduced into all heavy-duty engines the greatest valve advancements ever. As an example, see the exhaust valve in diagram on right page. The valve stem is hollow and partially filled with powdered sodium. When the sodium gets hot, it *turns into a liquid.* As it moves up and down, it carries heat away from valve head—*allows it to operate up to 225° cooler!* Result: a cleaner-running, more burn-free, longer-lived valve face.

Ford's long-lasting engine design pays off for you in every way. You save money on parts replacements such as piston rings and bearings. You save on shop labor—extend time between preventive maintenance jobs like valve adjustments, valve grindings, compression tests, ring jobs and the like.

And you can save on driver costs if you can keep trucks out of the shop and on the road. Yes, you save in every way when you get more work done per truck!

There's a Ford Truck for every trucking job. Before you buy your next truck, Test Drive a Ford Economy Truck.

FORD TRUCKS LAST LONGER

Certified by independent insurance actuaries for the ninth consecutive year! Studies of over 10,068,600 current license registrations show that Ford Trucks last up to 9.9% longer than any of the other 4 leading truck makes!

F-900—GVW 29,000 lbs.; GCW 60,000 lbs.

BIG SAVINGS in your business

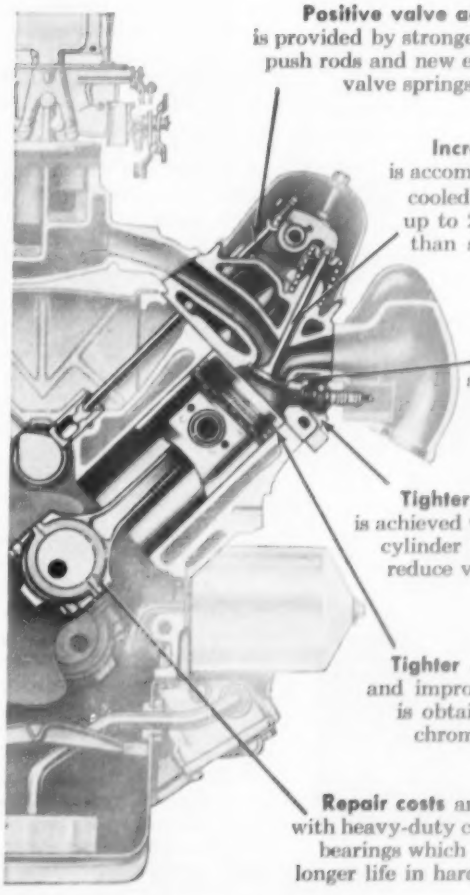
Hauls up to 3000 lbs. more than other 6-wheelers—New Ford T-800

● New power and hauling capacity of the Ford Tandem BIG JOB cuts hauling time on every run—makes giant cargos seem lightweight. You have a choice of two gas-saving Short Stroke engines. Either the 190-h.p. *Torque King* Y-8 or, the 200-h.p. *Torque King* Special Y-8.

You have new engine advancements for longer life (some explained and illustrated at the right).

New high-capacity tubeless tires, heavy-duty 5-speed transmission and Power Steering are standard equipment, at no extra cost. Two 3-speed auxiliary transmissions and full-air brakes are available at low extra cost.

New *Driverized* Cabs for driving comfort and convenience have *Lifeguard* Design safety features found in no other truck. Lifeguard steering wheel helps protect driver from steering column; Lifeguard door latches help keep doors from jarring open in case of accident.



Positive valve action is provided by stronger, tubular push rods and new equal-coil valve springs.

Increased valve life is accomplished with sodium-cooled exhaust valves—up to 225° cooler-running than solid-stem valves.

Longer valve and seat life are the result of solid tungsten-cobalt alloy facings and exhaust valve seat inserts.

Tighter valve closing is achieved with stress-relieved cylinder heads that help reduce valve distortion.

Tighter compression seal and improved ring durability is obtained with thicker chrome-plated rings.

Repair costs are lower with heavy-duty copper-lead bearings which provide longer life in hard service.

SLAG CONVENTION

(Continued from page 68)

dealing with highway legislation.

Officers re-elected for 1956 were R. O. Dierker, president; R. K. Plumb, vice-president; E. W. Bauman, managing director-secretary; and W. S. Shaw, treasurer.

On the social side of the meeting, the group spent one day visiting the Bellingrath Gardens — the trip being made via boat to Mobile and thence by chartered bus to the Gardens. On the evening preceding the annual banquet, all men present were commissioned as Colonels in the Confederate Air Corps.

Many of the group also inspected the concrete pipe plant of the Cen-Vi-Ro Corp., Mobile, Ala., which is headed by C. W. Ireland, president, Birmingham Slag Co.

Washington, D. C., was selected as the location for the next annual meeting, with the exact dates to be fixed at a later date.

Joins N.C.S.A. Staff

RICHARD M. PREWITT has been appointed assistant to J. R. Boyd, administrative director of the National Crushed Stone Association. He has been serving with the Chamber of Commerce of the United States since 1953, first as administrative assistant in the service department and later as assistant to the manager of the manufacture department. A native of Florida, Mr. Prewitt majored in business administration at the University of Florida. He moved to Washington, D. C., in 1939, to accept a position with the Farm Credit Administration of the Department of Agriculture. After serving in the Army Air Force from 1943 to 1946, Mr. Prewitt returned to the government and in 1947 was appointed a member of the management staff of the Treasury Department. In 1950 he was named Section Head of the Administrative Division of the Office of Price Stabilization.

Chase Ltd. Photo

Richard M. Prewitt

The major portion of Mr. Prewitt's duties while with the U. S. Chamber of Commerce consisted in the issuance of publications, the planning and staging of field conferences and in surveying, analyzing and publicizing results of operations of chambers of commerce throughout the United States. A graduate of the Southeastern Institute of Chamber of Commerce Executives, he also worked closely with local organizations on industrial and community development programs and with the American Industrial Development Council.

Compact Floating Plant

(Continued from page 56)

moved laterally by cables and a hand winch that is on the operating deck of the dredge. The winch was formerly a part of the gold dredge shore mooring line assembly. The south Denver plant does not recover any gold although the material carries about 1 cent values in gold per cu. yd. This is too low grade to recover economically.

Designing and building a dredge with the relatively small floor area so as to get the equipment aboard and to maintain proper bouyancy required unusual skill. Besides the processing equipment there are a total of 15 belt conveyors on the floating assembly. The dredge is all-steel construction and was built under direction of the mechanical and engineering staff of the company.

The floor area of the dredge is 58 x 62 ft. and is 20 ft. high above the water line. Under the deck are nine pontoons; six are 4 x 8 x 40 ft.; one is 5 ft. 4 in. by 8 x 45 ft., and two are 5 ft. 4 in. by 10 x 50 ft. There are two out-rigger pontoons that hold their weight only and are intended to help support the boat should the steel cables holding the conveyor boom fail. The weight of the dredge is 390 tons.

On the upper deck is the control room that features one set of controls for the starboard side and one for the port side. A recording ammeter is mounted nearby so that starts and stops are indicated.

In building the dredge an area was excavated some 11 ft. deep and above the level of the pond where it now operates. One end of the gravel pit was deepened to 17 ft. and the general principle of a dry dock was used in floating her. Water was pumped into the construction pit, then the plant was floated to the deeper section and the water allowed to drain down to the working pond level.

Denver, climatically, is such that concrete can be poured all the year around as modern pouring techniques are practiced where sub-freezing weather prevails. However, the cold weather is often severe enough to stop all gravel plant operations as water lines and belts freeze, along with the accompanying evils of cold weather. This combination of pouring concrete continuously and not being able to dig gravel at the same time means that stockpiles have to be maintained ahead of sales.

All material from the plant is shipped by trucks. Materials are weighed on Printomatic, Fairbanks Morse truck scales. An inter-plant communication system is used between the dredge, scale house, plant office and shore line points.

The new plant is located on the east bank of the Platte river near W. Hampden Ave. and in the Englewood district, a suburb of Denver to the south. There is available about 40 ft. of gravel with nominal stripping, which is, for the most part, pushed back with a Caterpillar D-8 equipped with a LeTourneau dozer. The gravel is relatively small in size and clay inclusions are not a problem. The general topography is relatively flat which is an aid to this type of operation. The Cooley Gravel Co. controls 130 acres at the south Denver site.

Main offices of the Cooley Gravel Co. are at the north Denver plant (6101 Lowell Blvd.), Denver 11, Colo. C. G. Cooley is president and general manager. L. M. Cooley is vice-president, David Hughes is secretary-treasurer, and James B. Cooley is office manager. E. J. Wemlinger is superintendent of all plants and H. Orville Enderud is chief engineer and also in charge of the older plant. Morgan Williams is in charge of the new dredge and Bill Adams is superintendent of the third plant under construction. Frank W. Graham is in charge of sales for the three plants.

Announce Recapitalization

AMERICAN AGGREGATES CORP., Greenville, Ohio, stockholders recently authorized a plan of recapitalization calling for an increase in the authorized number of common shares from 350,000 to 1,050,000 and a change of common shares without par value to common shares having a par value of $5 each.

YOU CAN DEPEND ON "Eucs"

Mine and quarry operators the world over have standardized on Euclid equipment for moving rock, coal, ore and overburden on the toughest jobs. At this big metal mine in Canada, for example, 12 "Eucs" of 22 ton capacity haul overburden and ore from a pit that's over 100 feet deep and will go down another 200 feet or more. These rugged Rear-Dumps have the stamina to withstand the day after day pounding of heavy excavation loaded by large shovels. With 300 h.p. diesel engines, they have plenty of power for carrying big loads on difficult hauls at travel speeds that mean more loads per hour.

Other Rear-Dump "Eucs" have capacities of 10 to 50 tons . . . engines of 143 to 600 h.p. . . . single and tandem drive axles . . . 5 or 10 speed transmissions or Torqmatic drive . . . spring mounted or semi-rigid drive axles. Your Euclid dealer will be glad to discuss your off-the-highway hauling problems and provide a production and cost estimate for present or planned operations. There's a good chance that he can show you the way to lower hauling costs.

EUCLID DIVISION
GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

EUCLID

GM
MORE POWER FOR YOU

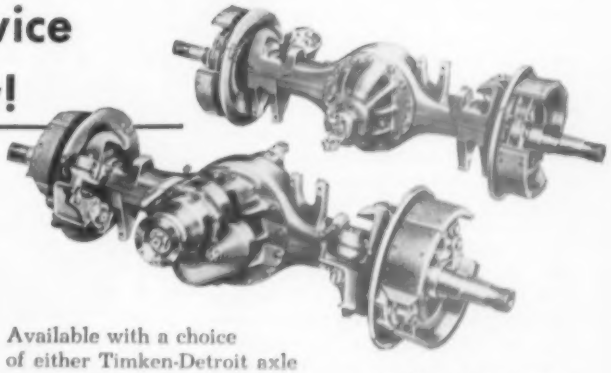
New TDA® lightweight

7,500 EXTRA TON-MILES

highway tandem gives

PAYLOAD A YEAR*

...built almost entirely from interchangeable standard axle parts for easier service and lower parts inventory!



This new lightweight tandem brings two important new advantages to construction truckers – greater payload capacity† and much easier maintenance.

More than two hundred pounds lighter than any other unit of the same capacity, this new TDA tandem will save a trucker 7,500 deadweight ton-miles during an average 75,000 mile year. This means more payload and profit where it counts.

Almost all of the parts – gears, pinions, differentials and brakes – used in this new tandem are interchangeable with parts from Timken-Detroit® standard single axles. This assures operators less down time . . . faster, simpler, more economical service . . . and smaller replacement parts inventory.

Available with a choice of either Timken-Detroit axle connecting groups, or brackets to accept other approved chassis hook-up parts. Plus these additional advantages with the Timken® lightweight tandem:

TDA Inter-Axle Differential Divides Torque Evenly Between Axles . . . and yet permits wheels of one axle to revolve faster or slower than wheels of the other axle. This means both axles are always doing equal amounts of work . . . driving parts and tires last longer.

Driver-Controlled Lockout – with TDA inter-axle differential, the driver can obtain the advantages of straight-through drive under slick or icy conditions by locking out the differential at *any* driving speed.

Big, Dependable Hypoid Gears rotate in conventional direction for maximum gear and bearing life.

This new highway tandem insures new payload profits, faster, easier service and operating economies for construction truckers everywhere. For complete information contact your nearest vehicle dealer or branch.

*based on 75,000 highway miles a year.
†for the same gross vehicle weight.

TIMKEN Detroit AXLES

TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN

The Accepted T D A Standard
TRADE MARK REGISTERED

World's Largest Manufacturer of Axles for Trucks, Buses and Trailers

Plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

Graphic Method of
PROPORTIONING SANDS

• Triangular Co-ordinates to determine graphically the required percentages of three component sands for a desired Fineness Modulus and grading of the blend

By IRVING WARNER*

THERE HAVE BEEN VARIOUS ARTICLES and publications on the use of triangular coordinates for proportioning three sands of various F.M. (Fineness Modulus), and for the determination of the resulting grading of the blend. But it seems to this writer that these presentations have not been simple enough for the average operator in the production of sand.

Many operators must blend three sands to secure a desired F.M. and grading. In some cases, it is necessary to bring in a sand of special grading to improve the grading of the main deposit.

The triangular co-ordinates make a simple method of obtaining the percentages of three sands that will give a desired F.M. They also give the resultant grading of those percentages. The method is quite easy to master.

Referring to Graph A, the three sides of the triangle represent the three sands. Sides are in percentages, 0 to 100 percent, clockwise. The upper left side represents fines; the upper right, masons sand; and the bottom, grits.

*Vice-president, Warner Co., Philadelphia, Penn.

The particular characteristic of the triangular co-ordinates is that any point in the triangle sums up to 100 percent of the three sides. The lines from the point to the sides must always be drawn towards the smaller end of the percentages marked along the sides.

For example, point A, is seen to consist of fines, 60 percent; masons, 30 percent; and grits, 10 percent; totaling 100 percent. The same is true of any point within the triangle.

It is first necessary to know the sieve analyses of the three sands. For the sake of an example, the three sands are assumed to have the following analyses:

Table 1: Analyses of Three Sands

Passing:	% in.	No. 4	No. 8	No. 16	30	50	100	F.M.
Fines	100	100	100	100	90	60	20	1.30
Masons	100	100	100	96	74	25	5	2.00
Grits	100	88	57	15	6	0	0	4.40
Assumed Specifications	100	95/100	70/90	50/80	30/60	15/25	2/6	

The following table shows a typical calculation for the F.M. of any combination of sands:

Table 2: Calculation For Point A, Graph A

	Blend		F.M.		F.M. Percent
Fines	60 Percent	×	1.30	=	.78
Masons	30 Percent	×	2.00	=	.60
Grits	10 Percent	×	4.40	=	.44
Total	100 Percent			F.M.	1.82

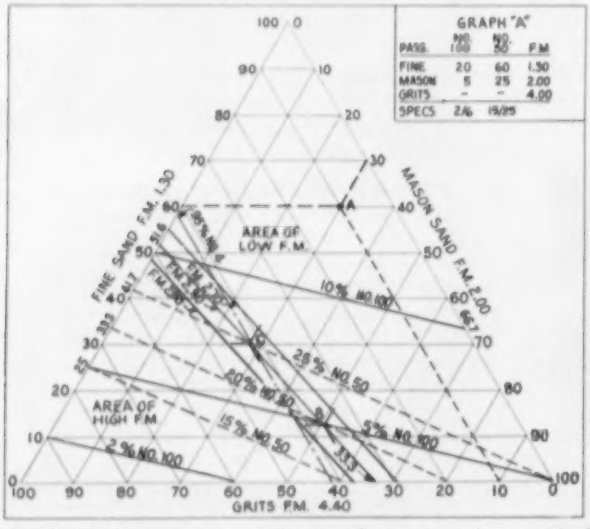
It is possible to draw a line across the graph so that every point on that line will have an F.M. of 2.80 (or any other desired F.M.). This line is determined by the following means:

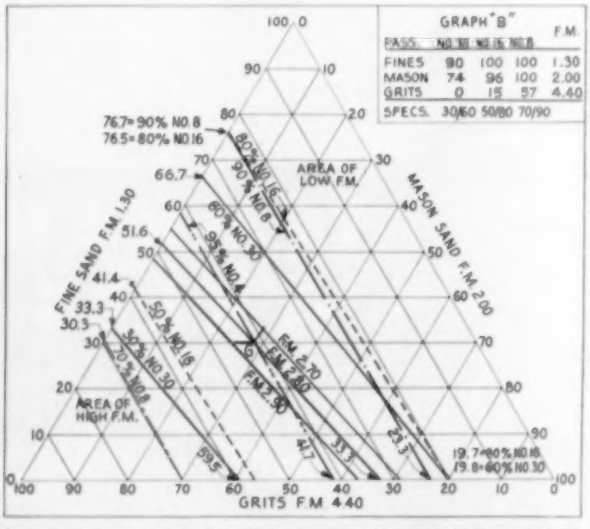
Since the F.M.'s of both fines and masons sand are below 2.80, a combination of these two is useless. We must find the following combinations:

Fines and Grits, with Masons = 0

Masons and Grits, with Fines = 0

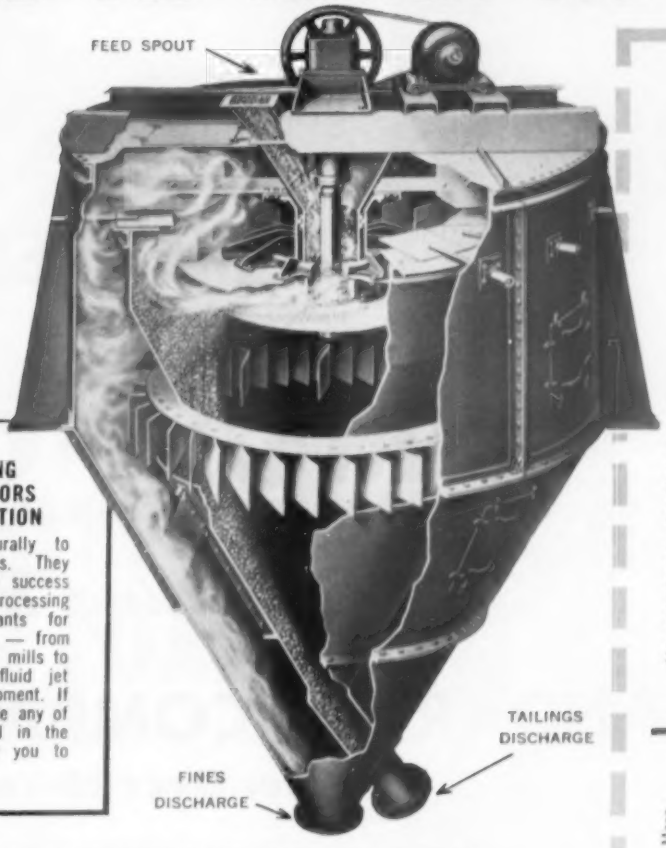
We use the formula for finding the percentages of two components to give a desired blend. This formula is given on page 80.





Graph A: The three sides of the triangle represent three sands. Sides are in percentages, 0 to 100 percent, clockwise. The upper left side represents fines; the upper right, mason sand; and the bottom, grits. **Graph B:** To avoid complication on a single graph, the limit lines for the coarser sieves, No. 30, No. 16, No. 8, and No. 4, are drawn on Graph B

40 TO 400 MESH OUTPUT UPPED AS MUCH AS 300%



ENGINEERING AIR SEPARATORS TO SPECIFICATION

. . . comes naturally to Sturtevant engineers. They have a tradition of success in developing dry-processing equipment and plants for more than 75 years — from the first rock emery mills to the most modern fluid jet micron-grinding equipment. If your problems include any of the processes listed in the coupon, it will pay you to investigate.

WHAT CAN A STURTEVANT AIR SEPARATOR DO IN YOUR PULVERIZING SYSTEM?

In the cement industry, Sturtevant Air Separators have a tested record of increasing mill capacities from 25 to 300% while lowering power consumption as much as 50% — when used in closed circuit with grinding mills. Maybe they can do as well for you.

Easily adaptable to your materials. Sizes of Sturtevant Air Separators range from 3 to 18 feet in diameter. They deliver fines from 40 to 400 mesh at rates as high as 100 tons per hour.

Designed to cut costs! Sturtevant Air Separators are built for a lifetime of low-downtime service. Rugged construction plus easy accessibility for quick maintenance (typified by the "OPEN-DOOR" design in other Sturtevant equipment) assures more output per machine-year. Check the coupon for more information.

STURTEVANT

Dry Processing Equipment

The "OPEN-DOOR" to *lower* operating costs over *more* years

CRUSHERS • GRINDERS • MICRON-GRINDERS • SEPARATORS
BLENDERS • GRANULATORS • CONVEYORS • ELEVATORS

My dry-process materials are:_____

Desired capacity is:_____

Name_____ Title_____

Firm_____

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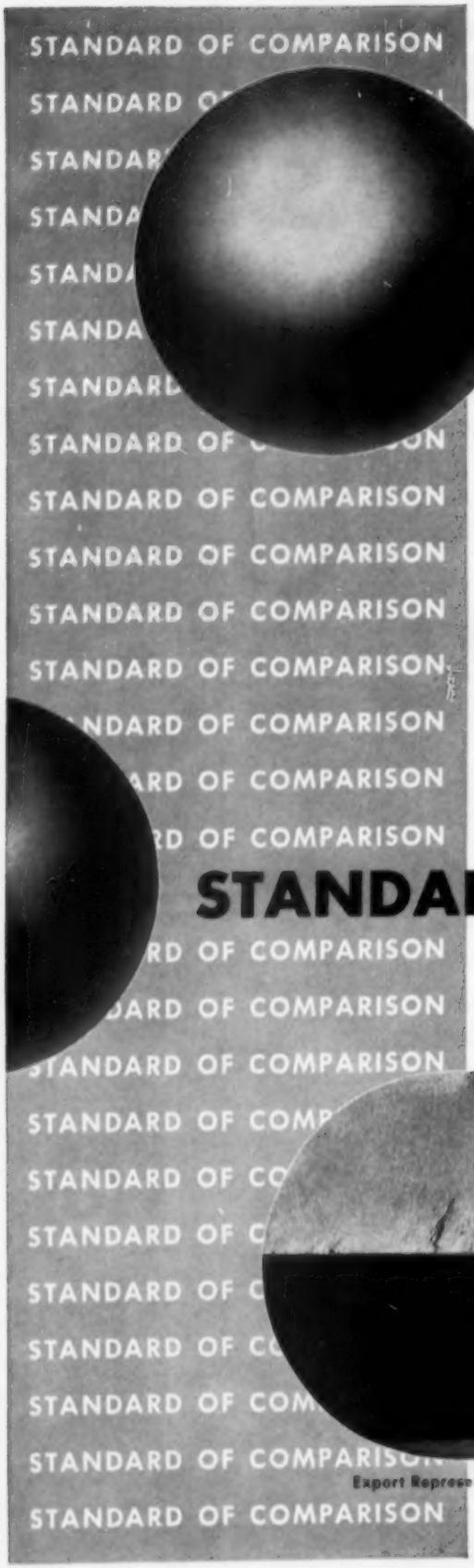
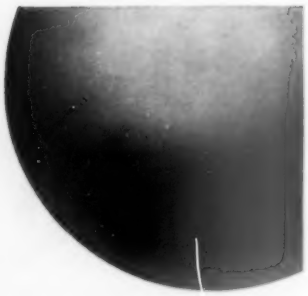
City_____ Zone_____ State_____

STURTEVANT MILL COMPANY, 102 Clayton Street, Boston 22, Mass.

Please send me your bulletin on Air Separators ☐
Also bulletins on machines for:

☐ CRUSHING ☐ GRINDING ☐ PULVERIZING
☐ MICRON-GRINDING ☐ SEPARATING ☐ BLENDING
☐ SUPERFINE SELECTING ☐ GRANULATING ☐ CONVEYING





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ARMCO

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Grinding Balls

STANDARD of COMPARISON

for Over 20 Years!

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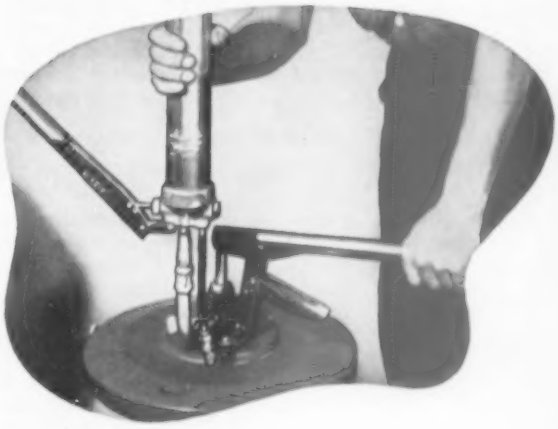
DIVISION
ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA

Export Representatives: **ARMCO INTERNATIONAL CORPORATION** Middletown, Ohio

YOUR PRODUCTION GOES UP...

when you switch lubrication methods from

Backward to Forward!



ALEMITE HAND GUN WITH LOADER PUMP

reduces downtime...cuts man-hours

...saves right down the line!

Why more and more plant managers look to Alemite lubrication for greater output:

Time studies prove it! Refilling hand grease guns with fast, efficient Alemite Loader Pumps saves you *15 man-hours* for every 400-pound drum of lubricant, compared with loading the old-fashioned hand-and-paddle way!

You eliminate the cost, mess and fire hazard of "oil-room" spillage. With Alemite equipment you can *transfer, load and apply* lubricant that you know is *completely* free of dirt, grit or abrasives. Machine-hours are saved, too! With better lubricated bearings, machines stay new longer!

Alemite can furnish a hand gun of correct capacity for your operation—from 8 ounces to 2 pounds. And you get the pressure you need—up to 15,000 pounds! There is an Alemite Loader Pump to fit any standard lubricant container you normally use—stationary models for 100-lb. and 400-lb. drums; portable models for 25-lb. and 35-lb. pails.

Ask your nearest Alemite supplier for full details.

• A drum of lubricant arrives—fresh from the refinery.

• Alemite Loader Pump is inserted . . . completely reseals drum against contamination.

• Loader pump nozzle engages fitting on Alemite gun. A few strokes of pump fills gun completely.

• Now the Alemite Hand Gun is ready to deliver "refinery-fresh" lubricant to any machine!

FREE! New Booklet:
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Please send me my FREE copy of "5 Plans for Better Lubrication."

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Address .....

City ..... State .....

ALEMITE

REG. U. S. PAT. OFF.

Ask anyone in Industry

A PRODUCT OF SW STEWART WARNER

$$x = \frac{B - C}{B - A} \text{ or } \frac{C - B}{A - B}$$

Assume Masons = 0. As this places one end of the F.M. 2.80 line on the fines base line, we want to find the value of the fines.

x = Percent of Fines, A
A = F.M. of Fines = 1.30
B = F. M. of Grits = 4.40
C = desired F.M. = 2.80

Decimals can be omitted for convenience

$$x = \frac{B - C}{B - A} = \frac{440 - 280}{440 - 130} = \frac{160}{310} = 51.6 \text{ Percent}$$

Plot this point on the fines base line. At this point, grits = 48.4 percent, and masons = 0.

Check calculation:

Fines	1.30 x 51.6 Percent =	.67
Masons	2.00 x 0.0 =	0.00
Grits	4.40 x 48.4 =	2.13
Total	100.00 Percent	2.80

In the same way, we calculate for the point on the grits base line where fines = 0.

Make the value A, for the point on the grits base line.

Fines = 0
x = Percent of Grits, A
A = F.M. of Grits = 4.40
B = F.M. of Masons = 2.00
C = desired F. M. = 2.80

$$x \text{ (Percent of Grits)} = \frac{200 - 280 = -80}{200 - 440 \quad -240} = 33.3 \text{ Percent}$$

Plot this point on the grits base line where masons sand = 66.7 percent, and fines = 0. The calculation may be checked by the method used above.

Join these two points with a straight line. Any point on this line will have F. M. = 2.80.

Also plotted on the graph are the lines for F.M. = 2.70, and 2.90. Note that all three lines are parallel and equidistant. Hence any additional F.M. lines may be laid out graphically with sufficient accuracy.

Straight lines can be plotted on this graph to give the combination of sands for a desired specification at any given mesh.

See Graph A, on which the limit lines for 50 and 100 mesh are given. Also tabulated in the upper right corner of the Graph, is shown the grading of the three sands at No. 50 and No. 100.

See Table 1, above, for the analyses of the component sands.

Wanted: The line for 5 percent passing No. 100 sieve.

Since masons sand contains 5 percent minus No. 100, masons sand alone could be used. The right-hand corner is masons = 100 percent, and fines and grits = 0.

Also since fines = 20 percent, and grits = 0 percent passing No. 100, we can use 25 percent of fines (20 percent x 25 percent = 5 percent), and 75 percent of grits. Plot 25 percent on the fines base line where masons = 0 and grits = 75 percent.

Join the two points with a straight line. Any point on this line will give a blend containing 5 percent passing No. 100. Note the point B, where this line intersects the F.M. 2.80 line. Checking this point by the percentage method will show approximately F.M. 2.80, and 5 percent passing No. 100. Any slight discrepancy will be due to the errors of drafting or of reading the graph. Such errors are unimportant.

We can also plot a line of 10 percent minus No. 100 as follows:

Since masons sand has 5 percent minus No. 100, and grits is 0 percent minus No. 100, no combination of these two can be used to give 10 percent. The combinations must combine fines and masons sand, and fines and grits. Using the formula to calculate the percentage of masons sand, the A value in the formula, with the fines, will be 66.7 percent masons sand. Plot on the masons sand base line where grits = 0.

For masons = 0 percent, calculate percentages of fines and grits. Since grits = 0 percent minus No. 100, we can have 50 percent fines, and no calculation is necessary. Plot 50 percent on the fines base line. Join the two points.

It is now to be noted that almost the entire F.M. 2.80 line lies below the 10 percent minus No. 100 line. If at least 3 percent masons sand is added, the blend will be 10 percent or less of minus No. 100. But if less than 5 percent minus No. 100 is wanted, less than 12 percent fines must be used. (Point B, is 12 percent fines.)

By measuring with a tenth scale, interpolation can be made between the 5 percent and 10 percent line. For example, the point C on the F.M. line is halfway between the 5 percent and 10 percent lines, and should be 7.5 percent. The following table shows the percentages of the three sands and the calculation:

Table 3: Calculation of Point C, Graph A

	Blend Percent	F.M.	F.M. Percent	Minus No. 100 Percent	Percent Minus No. 100
Fines	36.5	x 1.30 =	.40	x 20	= 6.1
	27.5	x 2.00 =	.55	x 5	= 1.4
	42.0	x 4.40 =	1.85	x 0	= —
			2.80		7.5

This graph will therefore determine the percentage of minus No. 100 in the blend, depending where the F.M. 2.80 is taken.

Note: The two lines, 5 percent and 10 percent passing No. 100, are parallel, so the measurement through point C can be taken at any angle for convenience.

In the same way, two lines can be drawn for say 15 percent and 25 percent passing No. 50 mesh.

Calculations for the 15 percent line of minus No. 50:

Let Masons = 0 (A point on the fines base line)

Simply divide the 15 percent wanted by the 60 percent in the fines:

$$\text{Fines} = \frac{15}{60} = 25 \text{ percent}$$

Grits = 75 Percent

Plot 25 percent on the fines base line where masons = 0.

For Fines = 0 Masons sand contains 25 percent minus No. 50.

$$\text{Masons} = \frac{15}{25} = 60 \text{ Percent}$$

However, since this is the point where fines = 0, it must be plotted on the grits base line as 40 percent. Connect the 25 percent point on the fines base line to the 40 percent point on the grits base line. Any point on this line will give a blend containing 15 percent passing No. 50.

In the same way, calculate for the line of 25 percent passing No. 50. Since we now know that all such lines are parallel, the work is speeded by finding one point and drawing the 25 percent line parallel to the 15 percent.

$$\text{Fine} = \frac{25 \text{ Percent}}{60 \text{ Percent}} = 41.7 \text{ Percent.}$$

Plot on the fines base line and draw the parallel line. It goes to the right-hand corner where masons = 100 percent and where both fines and grits = 0.

The 20 percent minus No. 50 line is readily found in the same way.

$$\text{Fines} = \frac{20 \text{ Percent}}{60 \text{ Percent}} = 33.3 \text{ Percent.}$$

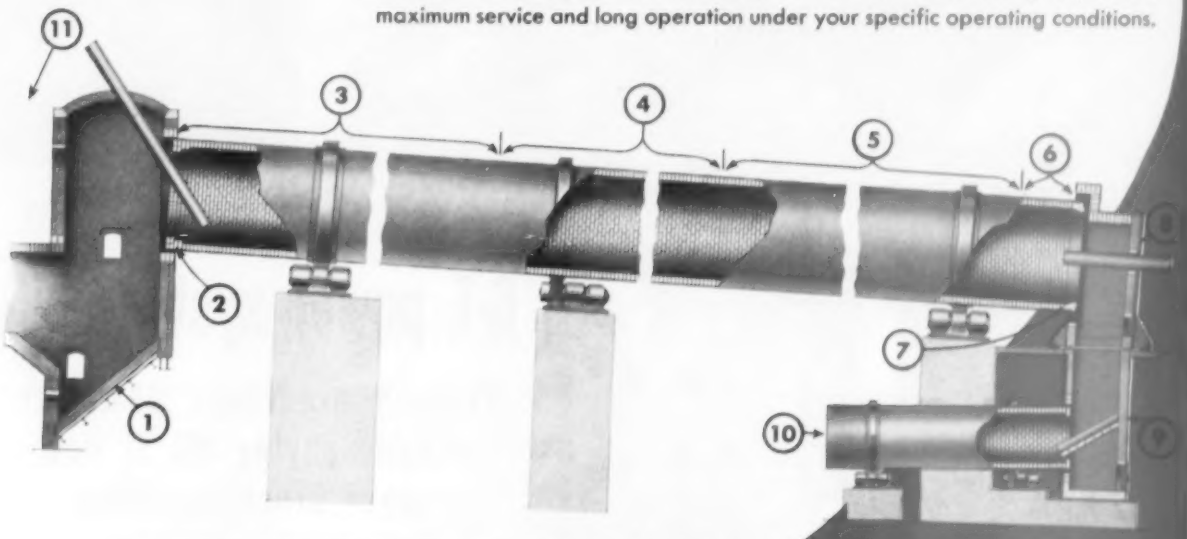
(Continued on page 84)

A. P. Green
REFRACTORY PRODUCTS

SERVE THE WORLD'S INDUSTRIES

A. P. GREEN REFRACTORIES LESSEN "DOWN-TIME" . . . RESIST WEAR IN THESE 11 CEMENT KILN AREAS

These recommendations apply to the majority of cement and lime kilns. Where unusual conditions exist, your A. P. Green Representative will work with you to determine the most effective and economical lining to provide maximum service and long operation under your specific operating conditions.



	In This Section Of Your Kiln	These A. P. Green Brick Will Give Better Service	Approximate Temperatures
1	Dust Collectors	EMPIRE OR OZARK Dry Press brick for moderate duty service.	Up to 1300° F. or 705° C.
2	Feed End or Tail Ring Construction	MEX-KO or EMPIRE for mechanical strength, structural stability and uniformity.	Up to 1400° F. or 760° C.
3	Drying or Preheating Zone	EMPIRE Liners for high strength, uniformity, resistance to abrasion.	Up to 1800° F. or 980° C.
4	Intermediate Zone	A. P. Green HOT ZONE Liners to resist spalling and abrasion.	Up to 2400° F. or 1315° C.
5	Burning Zone	KRUZITE Liners to resist chemical attack, slagging, spalling and abrasion.	Up to 2900° F. or 1595° C.
6	Cooling or Soaking Zone	A. P. Green HOT ZONE Liners to resist abrasion and spalling.	Up to 2500° F. or 1370° C.
7	Discharge or Nose Ring Block	MEX-KO or EMPIRE for mechanical strength, dimensional uniformity and resistance to thermal spalling.	150° F. to 2200° F. or 65° to 1205° C.
8	Kiln Hood	MEX-KO, EMPIRE or castable construction to resist spalling.	Up to 2400° F. or 1315° C.
9	Clinker Chute	EMPIRE to resist abrasion and spalling.	Up to 2200° F. or 1205° C.
10	Cooler	EMPIRE Liners for rotary coolers to resist abrasion and spalling.	Up to 2000° F. or 1095° C.
11	Waste Heat Boiler (not shown above)	EMPIRE or OZARK Dry Press brick for moderate duty service.	Up to 1200° F. or 650° C.

A. P. GREEN FIRE BRICK COMPANY
Mexico, Missouri, U.S.A.
PLANTS: Mexico, Mo. • Woodbridge, N. J. • Sulphur Springs, Texas
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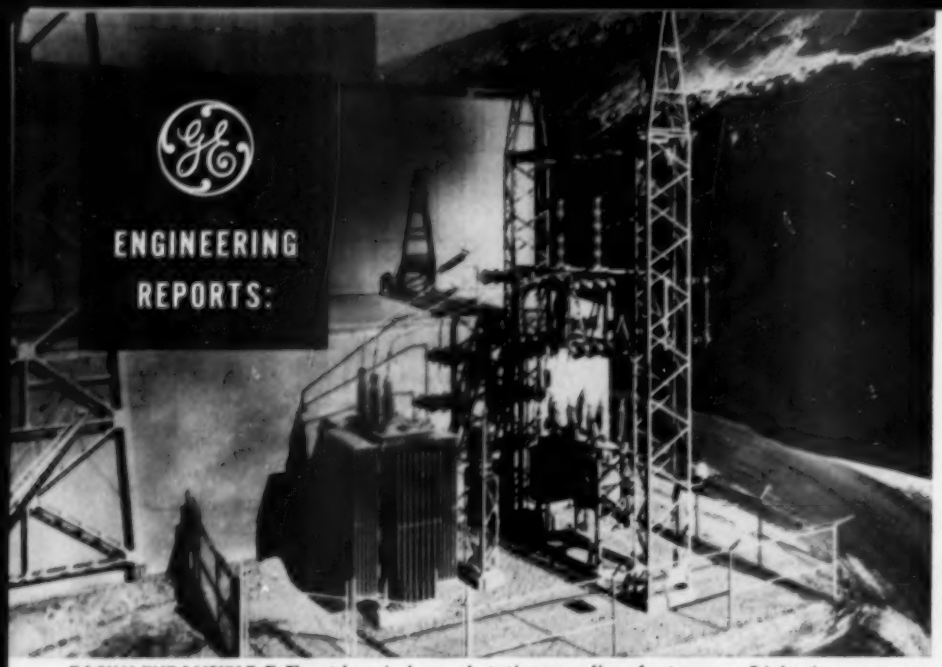


EASILY EXPANSIBLE G-E outdoor-indoor substation supplies plant power. Lightning arresters, circuit breaker with isolating switches, transformer, and system neutral grounding resistor are outdoors. High-creepage insulators reduce frequency of shutdowns for bushing cleanings.

RELIABILITY of G-E metalclad switchgear (indoor part of main substation) is reviewed by Carl

CENTRALIZED control of raw and finish mill 440-v motors is supplied by G-E Cabinetrol* units. Custom assembled from standard G-E components, they allow easy addition of sections.

*Reg. trade-mark General Electric Co.

"BUILDING BLOCKS" of power for expansion, G-E load-center unit substations can be added as needed to serve new load. Installed close to load, they reduce voltage drop, length of feeders.

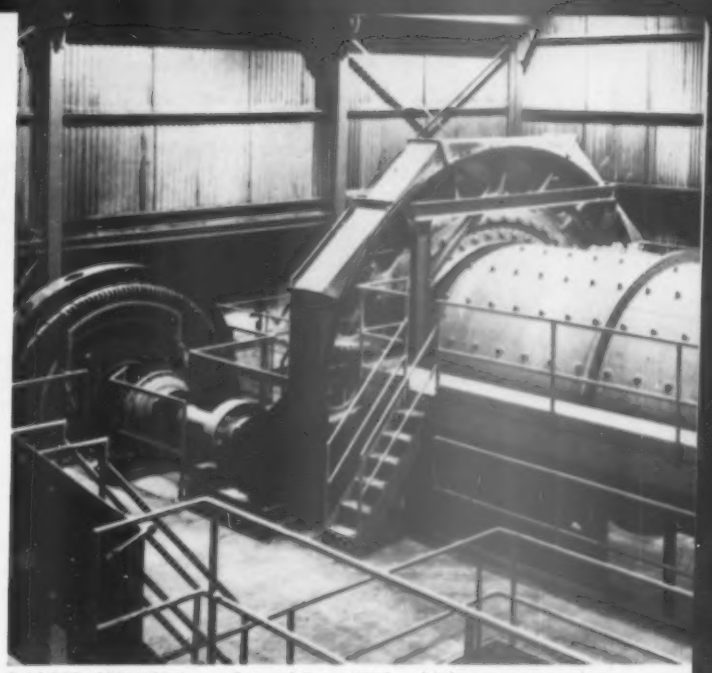
†Trade-mark General Electric Co.

G-E power system will

Planned-in-advance flexibility already paying off at new Sugar Creek facilities

Utilizing latest designs for dry-process plants, Missouri Portland Cement Company's new plant unit at Sugar Creek, Missouri, is now producing over 3000 barrels per day. However, in the face of ever-growing demands for cement by all industry, the company is already proceeding with expansion that will double plant capacity in the near future. This expansion will be smoother, less

Leonard (left), plant electrical foreman, and G-E sales engineer Harry Moak. Limitamp† starters (right) provide precision control of high-voltage motors, allow mill spotting.



RUGGED SERVICE is performed by 1250-hp, high-torque, synchronous motor driving 9½′ x 32′ finish mill. Motor was designed for across-the-line starting and to allow spotting of mill manholes.

help ease expansion at new Missouri Portland plant

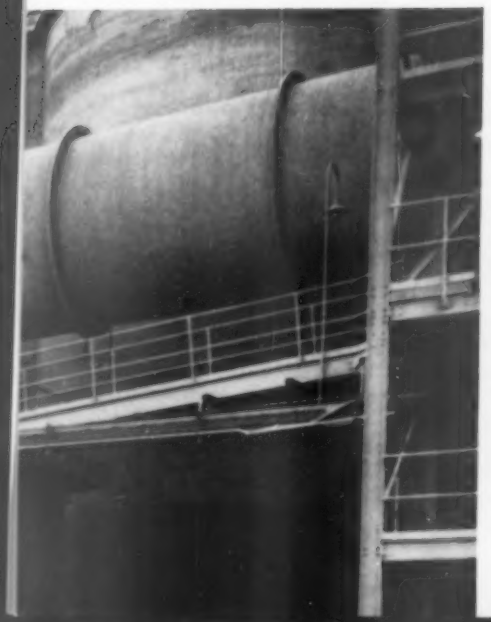
expensive, and more simply accomplished because, with the help of G-E engineers and equipment, plant designers planned ahead to assure easy expansibility through use of modern power system design.

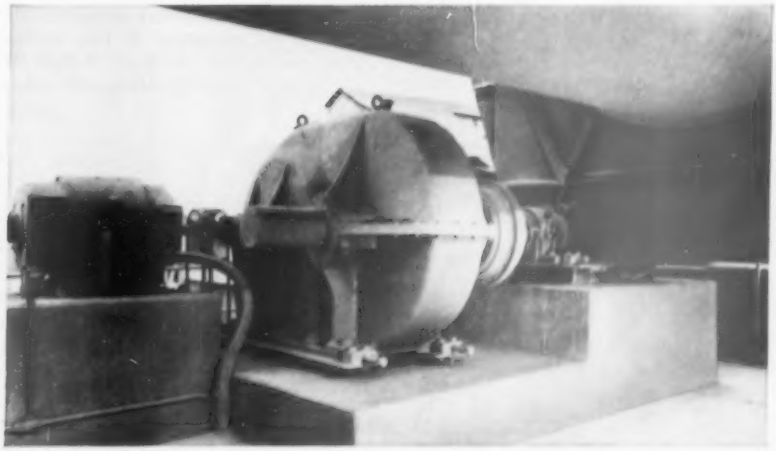
Working closely with Missouri Portland's engineers and consultants, General Electric cement industry application engineers helped develop this flexibility in an electrical system integrated with plant processes to facilitate smooth-flowing, reliable operation. Processing, as well as most materials-handling operations, is nearly 100-percent powered and controlled by G-E equipment.

Early in your electrical planning for a new or expanding cement plant, use G-E engineering aid to assure an electrical system designed for maximum output today and flexibility for expansion tomorrow. For further information contact your G-E Apparatus Sales Office or write for Bulletin GEA-5984 to General Electric Co., Section 658-16, Schenectady, N. Y.

Engineered Electrical Systems for the Rock Products Industry

GENERAL ELECTRIC





UNIFORM, CONTROLLABLE kiln speed provided by G-E adjustable-voltage, d-c motor (above) with speed reducer improves quality of cement through better process control. The 11¼′ x 350′ kiln is shown at left. General Electric motor-generator set and kiln-drive controller are installed beneath motor, inside kiln pier at far left.

Plot on the fines base line and draw the parallel line. Twenty percent being halfway between 15 percent and 25 percent, the line will be midway between those lines.

To avoid complication on a single graph, the limit lines for the coarser sieves of No. 30, No. 16, No. 8 and No. 4, are drawn on Graph B. Obviously a larger graph could be used, and all the limit lines be put on a single graph. Or plot only the lines found to be troublesome. It will be found that there is no problem at many sieves.

See Graph B, for 30 mesh: Limits of 30 percent and 60 percent passing No. 30.

For determination of the line for 30 percent passing No. 30 sieve, grits contains no minus No. 30, so calculate for fines and masons sand.

Fines contain 90 percent minus No. 30. Masons sand contains 74 percent. Wanted, 30 percent.

Fines 30/90 = 33⅓ percent
(Masons = 0. On the fines base line)

Masons 30/74 = 40.5 percent
(On the grits line as 59.5 percent grits base line where fines = 0)

Connect the two points.

Determination of the line for 60 percent passing No. 30 can be made in the same way. The line will run from 66.7 percent on the fines base line to 19.8 percent on the grits base line.

Determination of No. 16 lines at limits of 50 percent and 80 percent passing; also on Graph B, dotted lines.

The calculations are now slightly more complicated since the grits contain 15 percent passing No. 16. To find the points, we must use the following formula:

On the fines base line where masons = 0.

x = Percent of fines
Fines A = 100 percent passing No. 16
Grits B = 15 percent passing No. 16
Wanted C = 50 percent passing No. 16

$$x = \frac{C - B}{A - B} = \frac{50 - 15}{100 - 15} = \frac{35}{85} = 41.4 \text{ Percent}$$

Plot on the fines base line where masons = 0.

For fines = 0, determine grits. Use x percent and A for the grits.

Grits A = 15 Percent
Masons B = 96 Percent
Wanted C = 50 Percent

$$x = \frac{C - B}{A - B} = \frac{50 - 96}{15 - 96} = \frac{-46}{-81} = 56.8 \text{ Percent}$$

Plot on the grits base line.

Connect the points. Any point on this line will give a blend containing 50 percent passing No. 16. For 80 percent passing No. 16, calculate with the formula in the same way. It will run from 76.5 percent on the fines base line to 19.7 percent on the grits base line.

Note: Don't worry about these fine decimals. Just plot to the nearest round figure. It is good enough.

Again we will note that the F.M. 2.80 line lies well within the 50/80 percent lines of minus No. 16, so there is no problem.

Determination of the lines for 70 percent and 90 percent passing No. 8 sieve can be made by the same formula. For 70 percent, the line will run from 30.3 percent on the fines base line to 70 percent on the grits base line. For 90 percent passing No. 8, the line will run from 76.7 percent on the fines base line to 23.3 percent on the grits base line; shown as dot and dash on Graph B.

Again we can note that the F.M. 2.80 line lies well within the 70/90 percent minus No. 8 lines so there is no problem.

No. 4 sieve, limits 95 to 100 percent.

The 100 percent can be obtained only by omitting grits, and this would make too low an F.M. By using the formula or simple fractions, the 95 percent passing No. 4 is found to run from 58.3 percent on the fines base line to 41.7 percent on the grits base line.

Plot the 96 percent line (not shown on the graph). It runs from 66.7 percent fines to 33.3 percent grits. It is almost useless.

The 95 percent minus No. 4 line intersects the F.M. 2.80 approximately at point G, so for F.M. 2.80 not more than 41.7 percent of grits can be used. A lesser percentage can be used, whereupon the percent passing No. 4 will be somewhat greater.

With the exception of this limitation on percent of grits, Graph B shows there is no problem with these particular sands in the grading at the coarse sieves of Nos. 30, 16 and 8. Therefore the operator must study Graph A for the finer meshes of No. 50 and No. 100 to determine what percentages he may use.

If an operator has three sands; fine, medium and coarse, to blend together, he would do well to prepare graphs as described above. He can then quickly pick out the proportions of sand that will meet the specifications. Or, unfortunately, learn that no combination will meet the specifications because of bad range grading of the component sands. (Note: We could not get down to 15 percent passing No. 50 with these sands.)

Furthermore, he can modify his percentages in order to increase the percentage of a size he has in excess and save on the size that is in short supply.

It is of course necessary to make a graph for every combination of blending sand analyses and F.M.'s. It has been shown that with these three component sands, there was no problem at many sieve points. Ascertain initially what sieves are critical and use them only. For the sands assumed herein, graphs of No. 50, No. 100 and No. 4 only, would be necessary. This greatly simplifies and reduces the preparation and use of the graphs.

With repeated making of graphs, the work will become easier and faster. All graphs should be well labeled and saved. The accumulated graphs will, in due course of time, permit the operator to pick out a graph that is approximately correct and make a quick decision on the percentages required of the various component sands.

Blank triangular graph sheets of various sizes and grades of paper can be purchased from dealers handling drafting room supplies.

LIME KILN EFFICIENCY

(Continued from page 52)

Temperature Difference Gas-Lime Deg. F.	Loss Multiplier
180	1.53
360	1.65
540	1.79
720	1.96
900	2.16
1080	2.41

If, for example, at the temperature difference gas-lime of 1080 deg. F. at the boundary the heat loss V were reduced by .5 million B.t.u. per ton, the total heat expenditure will be reduced by .5 times 2.41 = 1.2 million B.t.u. per ton ("chain reaction").

Canadian Cement Production

PORTLAND CEMENT PRODUCTION in Canada increased to 16,385,359 bbl., for the first eight months of 1955, from 14,960,851 bbl. during the same period of 1954, according to a Dominion Bureau of Statistics report. This represents an increase of almost 10 percent.

Buys Agstone Firm

RONALD SHOUSH, owner of the Atlantic Grain Elevator Company, Atlanta, Mo., has purchased the agricultural limestone firm formerly owned by Clarence Sagaser, Jr., also of Atlanta.

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There are two reasons why KENSINGTON tracks give longer service, even under the severest working conditions.

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Second, they are made from a superior, wear-resisting alloyed manganese steel.

New Design. KENSINGTON tracks have only three parts . . . the rail, the grouser, and the pin. Rails are cast in *one piece* to add strength and prevent wear caused by the constant twisting and weaving found in ordinary tracks.

Grousers have anti-shear lugs which fit snugly over the tie bar of the link to eliminate loose plates, elongated bolt holes, and side-sway. Grousers are heavied-up at all critical points to better resist bending and breaking.

Pins, constructed of a special alloy, are pressed tightly in place under high pressure to give further rigidity and near-perfect alignment.

Yet, even with all these design improvements, KENSINGTON track assemblies fit all standard, popular make crawler tractors.

Steel with stamina. Development of several remarkable wear-resisting alloyed manganese steels, including ORO Supermang and Kenkrome, has also increased the wear-ability of KENSINGTON tracks. These already-hard metals *actually fight back against wear!* They develop *extra* surface hardness when exposed to friction, abrasion, or impact. Yet, under this ever-hardening "skin," these metals stay tough and strong. That's why KENSINGTON uses Kenkrome in its rails and Supermang in its grousers.

Economical, too. Though KENSINGTON tracks cost slightly more than those supplied by the tractor manufacturer, they enable you to make substantial savings.

They give you many more hours of service per dollar of cost, less time lost for maintenance, and increased operating efficiency because KENSINGTON tracks keep their "pull-bracing grouser area" for a longer period of time. Also, you can maintain a smaller inventory of repair parts.

Discover for yourself how many hundred dollars these tracks will save you over the next few years.

Mail the coupon for further details on how much KENSINGTON tracks will save you in the "long pull."

Other wear-resisting KENSINGTON replacement parts

FOR TRACTORS

Kenkrome replacement rims for worn sprockets. Ready to weld on.

CRUSHER PARTS

Jaw plates, roll shells, mantles and bowl liners, hammers, grate bars and liners, etc.

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Treads, rollers, racks, pinions and teeth . . . to fit all standard shovels.

CHAIN AND SPROCKETS

150 standard chains listed in new KENSINGTON Catalog plus many special chains. All of wear-defying Kenkrome.

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Model_____ NO. TRACKS PER BELT_____ WIDTH OF GROUSER_____

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

RESEARCH

On Cement Clinker and Concrete

• A summary of the Portland Cement Association Fellowship studies at the National Bureau of Standards

By DR. R. H. BOGUE*

Max Swerdlow with the electron microscope

THE THESIS OF THE PORTLAND CEMENT ASSOCIATION FELLOWSHIP PROGRAM at the National Bureau of Standards* can be briefly stated: The behavior of cement is a function of its compound (phase) composition and structure.

Our first problem was, therefore, to learn the nature and structure of the compounds that are produced by any given heat treatment of any given mixture of raw materials throughout the range (and beyond) of commercial cements. A necessary part of that problem involved the rate of reactions and the conditions of heterogeneous equilibrium whereby particular compounds might economically be assured or avoided. The means of study, as described below, have included the most advanced applications of physical chemistry that have been currently available.

The second problem was to learn the effects of each variable, as discovered above, on the properties of the resulting cement when the latter was utilized as the bonding agent in concrete. This part of the program involved the thermal, chemical, structural and physical study of the water reactions by virtue of which the compounds of cement attain and maintain the properties which make concrete the most widely used of all materials of construction.

The broad objectives of our whole research program may be set down as the elucidation of the following relations:

1. The production and constitution of clinker as a function of the composition and heat treatment of the raw materials.

2. The behavior of concrete as a function of the compounds or phases of which the cement is composed.

3. The control of the quality of clinker as a function of knowledge concerning its constitution and structure.

By the attainment of knowledge on the building blocks of clinker — on their constitution, structure and activity — we acquire the means for controlling the quality and extending the usefulness of cement and of all its products.

Production and Constitution of Clinker as a Function of the Composition and Heat Treatment of the Raw Materials

• There are two ways by which the reactions involved in the formation of a complex material may be systematically studied: By analysis and by synthesis. Both methods are commonly employed but they reveal quite different information. It is a relatively simple matter to learn by analysis the nature and amounts of the mineral oxides of which a clinker is composed. Thus we find that about 84 percent of clinker consists of lime and silica, and another 12 percent of alumina, magnesia and ferric oxide. The remaining 4 percent is made up of a variety of oxides as sulfur trioxide, soda, potash, titania, manganese oxide and others in diminishing amounts.

It is far less simple to learn the chemical nature of the actual compounds into which the component oxides have combined. Microscopic and various other examinations may give a detailed description of the properties of crystalline or amorphous grains, but those properties are useless in identifying the chemical nature of the grains until those specific properties have been found, by other means, to represent properties of a known compound.

The method of synthesis are best suited for obtaining pure compounds of known composition, the properties of which can subsequently be obtained and henceforth employed for identifi-

(Continued on page 89)

Dr. Fred Ordway operating crystal growing apparatus

*Abstract of a paper prepared on the Portland Cement Association Fellowship studies at the National Bureau of Standards.

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Here is the simplest, most effective diesel fuel system ever developed—the Murphy Diesel Unit Fuel Injection System. A low pressure fuel supply pump serving a unit fuel injector for each cylinder is all there is to it. There is no master high pressure pump. There are no high pressure fuel lines. On the rare occasions when service is necessary, just put in the spare injector and have the removed injector serviced at your convenience. But most important of all, the Murphy Unit Injector in combination with "true" diesel operation enables you to get more work out of every gallon of fuel . . . better performance at lower cost.

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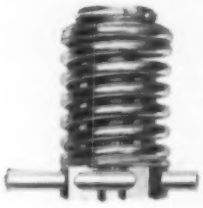
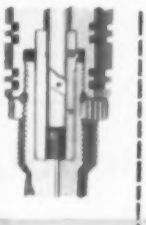
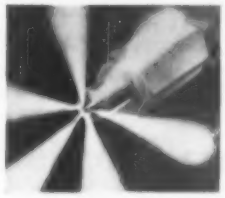


Injector drive is direct from the overhead camshaft by means of a rocker arm. Precision rack and pinion actuated by hydraulic servo type governor controls the amount of fuel to be injected.



Fuel enters the injector at approximately 20 psi, travels through an annular passage into the injector cylinder. No priming —no bleeding.

On the plunger's downstroke, the intake port is closed and the fuel forced out the nozzle through dual flat seat check valves — double protection.



Solid fuel forced through six properly sized holes in the nozzle is completely atomized as a fine fog and distributed through the incandescent air charge to provide thorough combustion.

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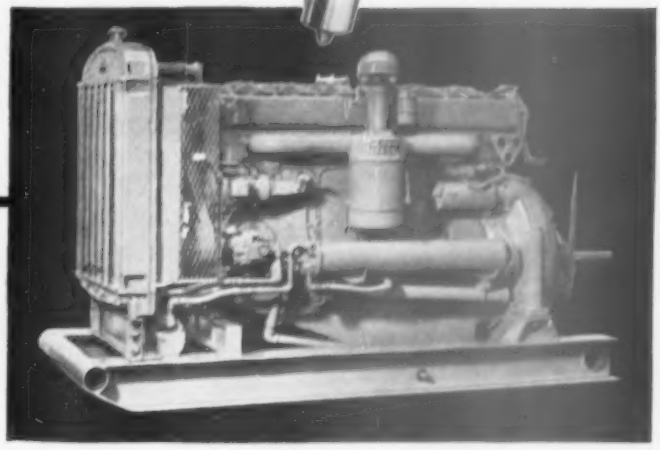

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cations. However, as the number of component oxides is increased above two, the complexity of the relationships increases enormously. In such case these systems can be explored systematically only by making use of the principles of heterogeneous equilibrium as laid down by Willard Gibbs in the thermodynamic law known as the Phase Rule. No attempt will be made here to define the law but only to say that by its use the phase relations in any workable system can be precisely established. Unfortunately, only relatively simple systems have up to now been workable.

What is intended to be conveyed by the above statement is that it becomes possible to predict with assurance the chemical nature and physical state of the products that will result from any given heat treatment of any given mixture within any system that has been completely delineated.

The goal is quite marvellous. Since the properties of a cement are a function of the chemical nature and physical state of its constituent phases, a control over those factors would place in the hands of the operator the means for controlling the properties of his product over a wide range. The catch lies in the question of the workability of the system: that is, the difficulties attendant upon the complete exploration of complex systems. Thus at the Geophysical Laboratory it took a large part of the time of three men for about ten years to complete their exploration of the ternary system lime-alumina-silica.

Much of our earlier work was carried on by similar methods but our field was rigidly delimited. In more recent years, mathematical advances by Dahl and improvements in laboratory techniques by Eubank, Newkirk and Ordway have enabled the exploration of complex systems to be expedited. This has enabled us to publish

Modern highway intersections on Long Island, New York

a report on a five-component system and to be presently engaged in the study of a six-component system. The value of these advances is apparent not only for cement research but as a contribution to the fundamental approach to heterogeneous equilibria.

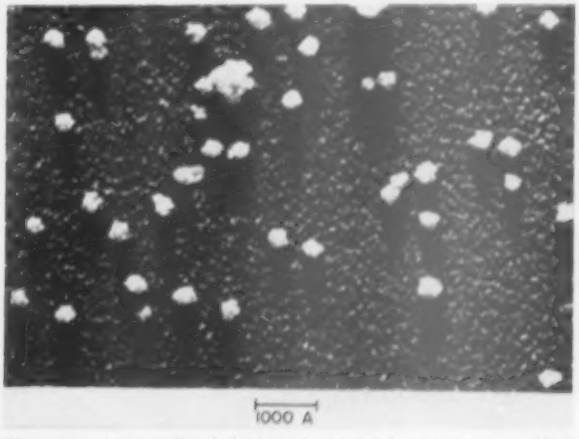
The Fellowship has reported studies on a considerable number of phase systems. In cooperation with Walter Dyckerhoff we disproved the German contention for the composition of the high-lime compound in portland cement and confirmed that phase as having substantially the composition of $3CaO{\cdot}SiO_2$. The further confirmation that the principal compounds of clinker were $3CaO{\cdot}SiO_2$, β-$2CaO{\cdot}SiO_2$ and $3CaO{\cdot}Al_2O_3$, modified in some measure by solid solutions, has been the basic structure upon which most of the world's research on clinker during the last quarter century has been built. It would be difficult to overestimate the importance of this fundamental work.

Microscopic methods of identification of the cement compounds were greatly improved, especially by polished-section and etching techniques, and X-ray diffraction methods were developed for the same purpose. Still later, spectroscopic techniques were introduced.

The iron systems of cement were first reported by the Fellowship in 1926, and in 1928 the announcement was made of the discovery of the iron-containing compound of clinker, having the composition $4CaO{\cdot}Al_2O_3{\cdot}Fe_2O_3$. This was found to be the end member of a continuous series of solid solutions between $2CaO{\cdot}Fe_2O_3$ and the hypothetical compound $2CaO{\cdot}Al_2O_3$. The importance of this discovery, as at once pointed out to the industry, lay in revealing a simple means for reducing the content of tricalcium aluminate in clinker without changing significantly the total alumina of the mix. The introduction of small amounts of iron ore or iron cinder to the raw mix has from that time been common practice in plants where the tricalcium aluminate would otherwise be too high.

In 1946 Swayze reported an extension of the solid-solution series to the composition $6CaO{\cdot}2Al_2O_3{\cdot}Fe_2O_3$. This

A photomicrograph of a polished section of cement clinker produced for the research program



Electron micrograph of hydrated portland cement magnified about 100,000 diameters

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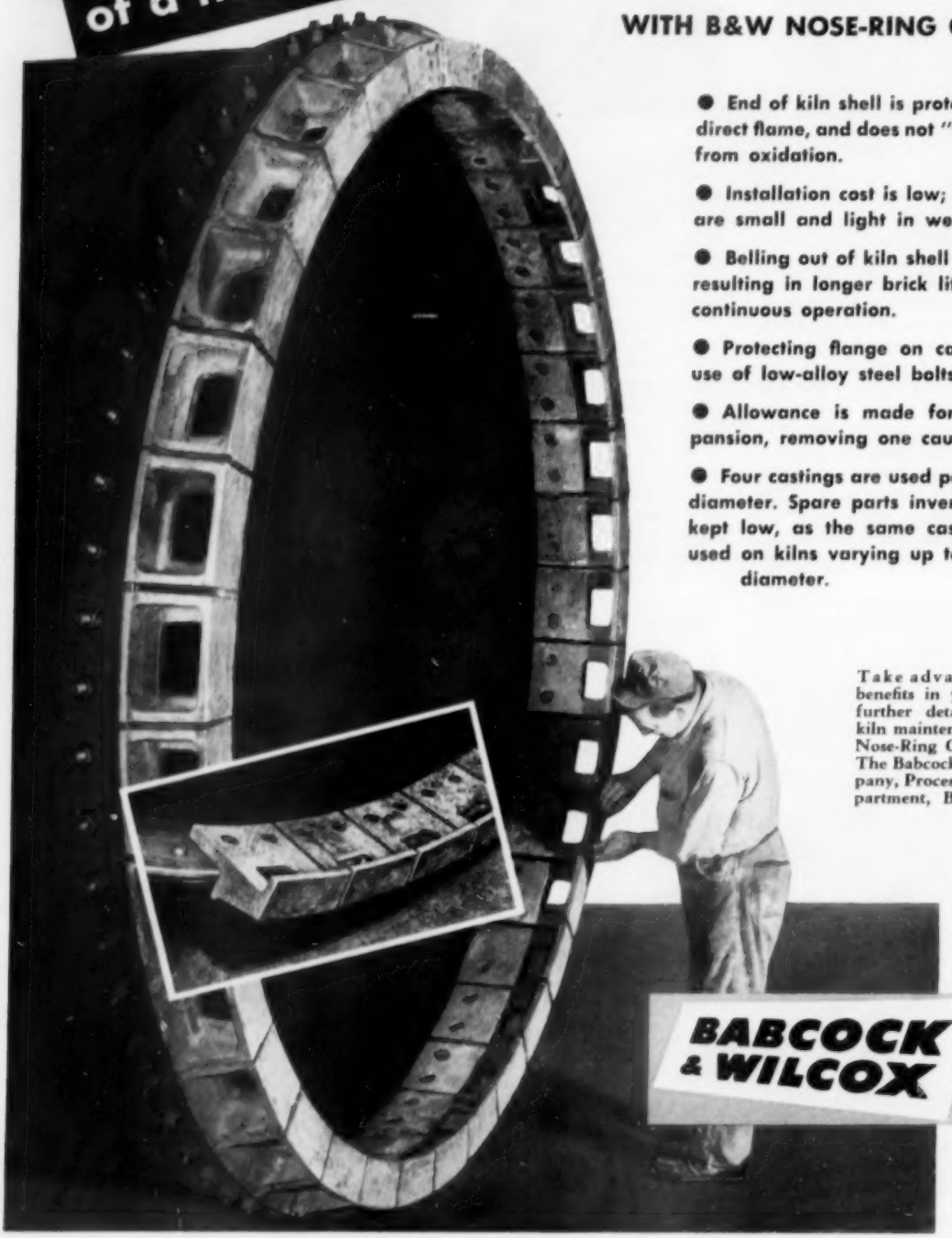
- **Four castings are used per foot of kiln diameter. Spare parts inventory may be kept low, as the same casting may be used on kilns varying up to two feet in diameter.**



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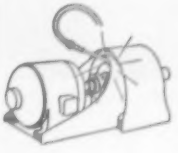

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finding indicates a slightly higher alumina content of the iron phase in most clinkers. The Fellowship is currently engaged in further study on the system for the purpose of confirmation and extension of information. By such study it is hoped to be enabled to compute the precise composition of the iron phase that will be formed under any given conditions of composition and heat treatment.

The role of magnesia also received early attention by the Fellowship and in 1928 that oxide was first reported to remain uncombined in clinker in the form of periclase (crystalline MgO). This has been a very important finding for the industry and led the way to the control of delayed expansion in concrete structures. Such expansion was shown to be caused by the hydration of periclase but not by that of an equal amount of magnesia dissolved in the glassy phase of the clinker. The magnesia was found to dissolve in the clinker liquid to the extent of about 6 percent, and the amount that remained dissolved in the glass was of course a function of the amount of liquid that remained uncrystallized on cooling the clinker. It became obvious that high glass contents were desirable for clinkers produced from high-magnesia raw mixes for the avoidance of delayed expansion. And it was found that such clinkers resulted when the charge was rapidly cooled. These findings led to the adoption of the autoclave test restriction, imposed upon itself by the industry, a magnificent example of the conviction of the industry that quality is of first importance, a principle which must be upheld even by the adoption of voluntary restrictions.

Alkalies have long been known to be present in raw materials and clinker but little attention was paid to them until Stanton demonstrated the disturbing effects of their interaction with certain reactive aggregates in concrete, giving rise at times to serious cracking in concrete structures.

The difficulty of exploring alkali systems is greatly increased because of the volatility of alkali compounds. By improved techniques, however, many systems containing soda or potash have been investigated, and Newkirk is currently exploring a six-component system containing both soda and potash. Since the alkali oxides show a preferential affinity for SO_3, it has been necessary to include that oxide as a component in some of these studies. The results have indicated the manner in which the alkali oxides react in clinker and the chemical nature of their compounds.

A twofold importance is attached to these findings: they show (1) that a very small percentage of K_2O or Na_2O is capable of producing a very large change in the chemical nature of the calcium silicates and aluminates respectively in the clinker and (2) that a very small amount of SO_3 is sufficient to neutralize that effect. In the absence of SO_3, the K_2O forms a complex calcium silicate, the Na_2O a complex calcium aluminate, but in the presence of SO_3 the alkali oxides form a solid solution of potassium sodium sulfate. This finding may play an important part in the control of the effects of the alkali-aggregate reaction. It may also find application in the controlled volatilization of the alkalies from the kilns during manufacture.

With the development of new principles, tools and techniques, our ability to probe the nature of materials is vastly expanded, our focus is sharper, our resolution deeper. Since the second world war, the new facilities for laboratory exploration have antiquated most of our earlier procedures. Electronics and spectroscopy, X-ray and electron optics and differential-thermal analyses have provided means for observation of reactions and products that were unthinkable at an earlier date. Hence it has become necessary to re-examine systems that had previously been explored, and in doing so we have found conditions that formerly were unsuspected. Solid solutions are everywhere the rule, rather than pure compounds, and trace elements are found to cause profound effects. By retracing our steps we sometimes discover the key to hitherto anomalous behavior.

Behavior of Concrete as a Function of the Compounds or Phases of Which the Cement is Composed

• It does not suffice to have exact knowledge of the compounds that are in clinker, and the means for their control, for that would serve no useful purpose unless we also knew the specific role of each compound in concrete. It is reasonable to assume that each compound imparts somewhat of its properties to the product when cement is mixed with water and aggregate. Hence our investigation would be incomplete if we did not also prepare clinkers of systematically varying compound composition and heat treatment, grind to varying fineness with varying amounts of gypsum, and test by various means.

For preparing clinkers we designed and built an 8-ft. rotary kiln in which we burned some 700 batches of clinker of about 75 lb. each, and ground with gypsum to produce over 50,000 lb. of cement. Portions of each batch were shipped to the Chicago laboratory of the Portland Cement Association where specimens were made and tested in accordance with standard specifications.

Many tests that were carried out at the Fellowship laboratory required the design and development of special methods and apparatus. A test was developed for determining free lime,

(Continued on page 96)

Terry F. Newkirk with his high temperature centrifuge

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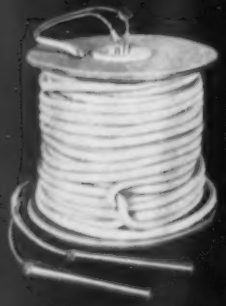
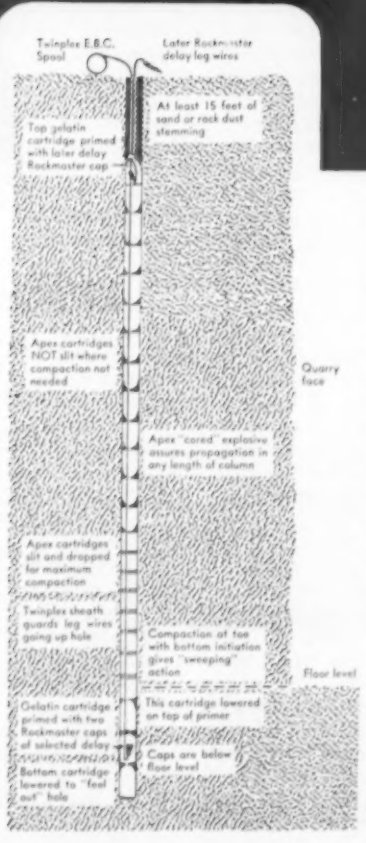


Twinplex Assembly



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That's the story in a nutshell—

ROCKMASTER® electric blasting caps at the bottom of the holes in an alternate pattern. Holes loaded alternately with Apex® LV and HV explosives to add to the "one-two" punch. Breakage excellent. A well spread muck pile that makes quick and easy digging for the shovel.

With Twinplex Assembly, you get all the advantages of ROCKMASTER millisecond delay blasting plus extra protection for the legwires. The two caps have their duplex legwires sheathed in a tough plastic tube. This sheath practically eliminates the chance of current leakage and any possibility that the wires might become damaged by falling cartridges or rough stemming material.

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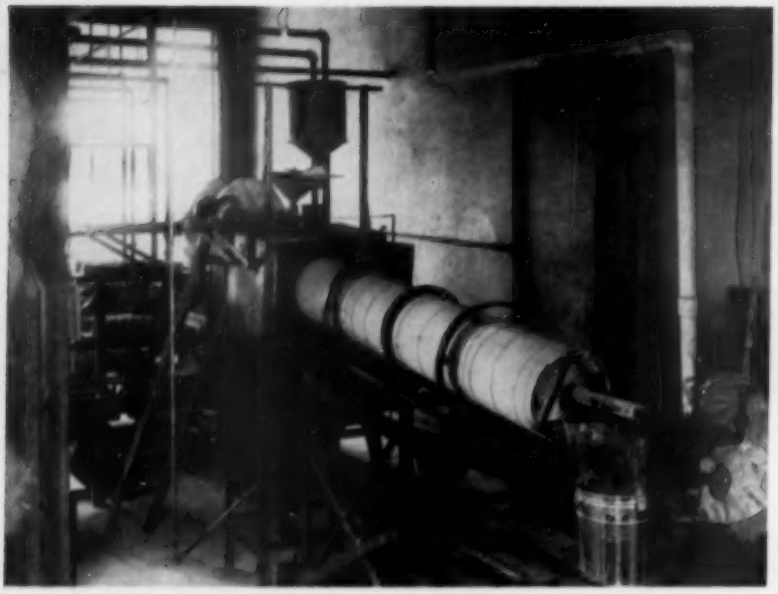

Experimental rotary kiln in laboratory used in Fellowship studies

RESEARCH

(Continued from page 92)

and calorimetric equipment was designed for determining the heat of solution and heat of hydration and glass content of clinker. Instruments were built for measuring the length change of specimens and a test devised by which the sulfate resistivity could be determined rapidly and accurately. The effects of admixtures of reactive siliceous aggregate (simulating a natural pozzolan) were studied and the factors giving rise to abnormal conditions of setting, soundness and strength were explored. In separate studies on cement paste, the hydration and hydrolysis of cements and cement compounds were investigated and the effects noted of the variations introduced in composition, heat treatment, fineness, gypsum content, etc.

The results of these many studies on the water reactions with cement, taken together with the results of studies on clinker, have brought about many changes in the fields of cement utilization. High early strength was shown to be obtainable by employing a raw mix that would give a higher percentage of $3CaO{\cdot}SiO_2$ in the clinker, at the expense of $2CaO{\cdot}SiO_2$. Low heat of hydration could be obtained by decreasing the $3CaO{\cdot}Al_2O_3$ and the $3CaO{\cdot}SiO_2$. Sulfate resistivity followed reduction in $3CaO{\cdot}Al_2O_3$. Hence the specification and manufacture of the five types of cement were a natural result of that information.

High glass in clinker was found to reduce not only the periclase but also the tricalcium aluminate; hence rapid clinker-cooling equipment and certain changes in the burning operation were introduced in the industry to insure high glass content. A method was proposed for calculating the potential compound composition of a clinker and this method has been introduced into plant control as also into specifications. The free lime test and liter-weight test are commonly employed for noting the completeness of the reactions in the kiln. Closed-circuit raw grinding has usually replaced the open-circuit procedure, since it was shown that the latter method produced a large amount of excessively fine material and a small amount of an excessively coarse material. The closed-circuit method avoids both.

The heat of solution method is used for noting the glass content, and the heat of hydration method for measuring the heat evolution during hardening. Length change measurement of specimens is routine procedure for noting volume constancy, and our method of test for sulfate resistivity has received favorable commendation by the American Society for Testing Materials. A specification for optimum SO_3 in cement has been adopted as a tentative standard. The flame photometer has been generally introduced for determining soda and potash in cements, and research laboratories are commonly using the X-ray and spectroscopic procedures for identification and analytical purposes.

Control of the Quality of Clinker as a Function of Knowledge Concerning its Constitution and Structure

• In the preceding sections much has already been said about the control of those variables in manufacture and utilization that are involved in defining the chemical constitution of clinker. To avoid reiteration, I shall present here only two additional series of investigations that are concerned largely with the development of information which may be applied to the control of constitution and structure of clinker. These are studies on the crystal structure and morphology of the cement compounds and their hydration products.

Crystals are composed of atoms that are arranged in a unit-cell pattern that is continued throughout the grain. The behavior of the material is determined not only by the nature and concentration of the atoms but also by the arrangement of the atoms in the lattice. Hence a knowledge of the atomic pattern in the unit cell provides an explanation for the properties of the material; it tells us why the material has the properties that are associated with it. For example, there are three or more crystal forms of dicalcium silicate. One of these (γ-$2CaO{\cdot}SiO_2$) we know to be unreactive with water and consequently not wanted in clinker. Another form (β-$2CaO{\cdot}SiO_2$) is slowly reactive with water and normally constitutes a considerable percentage of cement clinker. The "dusting" of clinker is the spontaneous inversion of the beta to the gamma form.

But a knowledge of the atomic pattern of the unit cell indicates also the ways in which a given lattice can be modified, and the means and energies that may be required to accomplish desired changes. Through the application of such information various minerals have been synthesized or simulated, and a systematic control of properties developed. Thus the presence of minor components, mineralizers, gases, coal ash, etc. take on a significance quite distinct from that which refers their action solely to the total composition.

The reactions, not only of clinker formation but equally of cement hydration, appear thus to be dependent upon the internal energy and structure of the reacting solids. The cause of a reaction can no longer be defined in terms of temperature - concentration alone, but requires integration also with energy levels, lattice states, and incidental reactions and transformations. Where such factors are subject to regulation, the operator has in his

(Continued on page 134)

GENERAL REFRACTORIES

time . . . measured by BRICK

The pulsing spring of the conductor's watch . . . the soaring radio tower of the Naval Observatory . . . the clock on your night-stand regulated by the 60-cycle current of your electricity . . . all owe their existence to brick.

It's refractory brick controlling the flames of industry, producing metals, glass, electricity that combine to measure and communicate time.

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The Industry Behind Industry
GENERAL REFRACTORIES COMPANY
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It is a beautiful 16 mm. motion picture in full color which relates the fascinating and little understood story about the refractories industry . . . *the industry behind industry.* Viewing time is 26 minutes. If you would like to show it to executive, employee, social, church or other groups, a request on your letter head is all that is necessary. Address General Refractories, Philadelphia 2.

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To date every HMS user in the sand and gravel industry has chosen the Wemco Mobil-Mill. It is a complete plant — pre-engineered — pre-fabricated — and of pre-determined cost. It is so thoroughly proven in design that it operates from the first day. It goes up in minimum time and at minimum cost. Then it knocks down and moves on when the deposit is exhausted. The Wemco HMS Mobil-Mill is available in capacities from 5 to 500 tons per hour.

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Down time in digging operations is costly—not only because of difficult on-the-job maintenance—but because down time of machines ties up costly labor and idles other expensive equipment. Lima shovels and draglines, with "built-in" stamina for the tough jobs, pay big dividends by assuring continuous operation with maximum output at lowest cost.

Painstaking care in every step of manufacture assures the quality of every part, long trouble-free service of every Lima machine. You'll be able to put a Lima to work and keep it working day in and day out with only routine maintenance.

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COMPARE QUALITY! No other machine gives you as much as **LIMA!**

1. Piston-ring-type dirt seal rings and retainers.
2. Moving parts are flame or induction hardened for longer life.
3. Main machinery is placed well back of center of rotation.
4. Anti-friction bearings at all important bearing points.
5. Big capacity drums and sheaves are easy on cables.
6. Propel and swing gears and power take-off are enclosed in a sealed oil bath.
7. Torque converter (optional on certain types).
8. Wherever you are, you can depend on skilled service and nearby warehouse stocks of parts.

These are only a few of the features which help you *strip more, dig more* and *load more* with a LIMA. There's a type and size for every job—shovels to 6 yds., cranes to 110 tons and draglines variable. Smaller capacities on rubber.

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Insulating FIREBRICK For Exposed Lining In Rotary Kilns

IN THIS ARTICLE

. . . the author outlines the steps which can be taken to conserve fuel in rotary kilns by the proper selection and installation of insulating firebrick. This is the first of three articles on this important subject

By LEOPOLD TSCHIRKY*

THE SUBJECT OF INSULATING LININGS in rotary cement kilns is not new. Such linings have been in use from the time the rotary kiln was first introduced for, obviously, any lining installed in a rotary kiln operating at temperature high enough to require a lining is essentially an insulating lining. What is new is the subject of insulating firebrick for exposed lining.

Originally the sole purpose of linings in rotary cement kilns was to protect the kiln shell from damage due to heat and any lining material that would do so for a reasonable length of time was considered quite satisfactory. That was true until after the turn of the century, for not until then did kiln designers and operators begin to focus real attention to improving kiln efficiency simultaneously with increased output. The result has been that we have seen a great many developments, all heading in the direction of greater overall operating efficiency. They include items beginning with raw material selection and preparation down to the finished product. These developments did not come about haphazardly nor were they stumbled upon by chance. They are the result of the greater combined knowledge gained through research, theory and practice stimulated by an unprecedented demand for cement and the ever present desire to produce highest possible quality at lowest possible cost.

Insulation, in the sense we presently use the term, first took on importance as simply a means to conserve fuel by reducing the heat lost through the kiln lining and conveyed and radiated from the kiln shell to the surrounding atmosphere. That still is one of the important functions to be performed by any form of insulated or insulating lining in a rotary cement kiln. Several well regarded authorities place the figure for heat lost through a conventional lining of refractory firebrick laid directly against the kiln shell and radiated from the shell, to from 6 percent to as high as 15 percent of the total heat supplied to the kiln.

W. R. Bendy and H. Straight in an article "Kiln Shell Heat Loss Re-Evaluated" that appeared in the May 1947 issue of ROCK PRODUCTS, reported total heat transfer from a single kiln, assuming surrounding still air temperature of 70 deg. F. and fireclay brick lining as follows:

Kiln Shell Temperature Deg. F.	Heat Transfer B.T.U. per sq. ft. per hour
100	44
200	262
300	582
400	1029
500	1637
600	2440
700	3465
800	4765

These figures check very closely those obtained in calculations following the procedure outlined in the American Society for Testing Materials manual dated February, 1952. They can be considered conservatively low because they are on the basis of *still air* at the kiln shell, a condition we know cannot exist when kiln shell temperature exceeds that of the surrounding air. How conservative these figures are can be seen by referring to Fig. 1 which is a reproduction of the curves appearing on page 141 of the aforementioned A.S.T.M. manual to show heat transmitted from a flat hot surface for varying velocities of surrounding air. For comparison the A.S.T.M. curve showing heat transfer at 70 deg. F. still air is also shown. The curves illustrate how rapidly the rate of heat transmission increases as the velocity of surrounding air increases. For example, if one assumes surrounding air velocity of 5 f.p.s. and atmospheric temperature at 70 deg. F. the heat transmisson would then be as shown in the table:

Kiln Shell Temperature Deg. F.	Temperature Difference	Heat Transfer BTU per sq. ft. per hour
100	30	85
200	130	465
300	230	935
400	330	1480
500	430	2180
600	530	3050 (Extrapolation)

Today, kilns measuring 10 ft. in diameter and 375 ft. long are no longer considered very large and kilns 12 ft. in diameter and 450 ft. long are not unusual. Such kilns have heat transmitting surface areas of 11,781.37 sq. ft. and 16,964.64 sq. ft., respectively. One can readily understand, therefore, why it is desirable to line a kiln with lining material that will reduce to the most practical minimum the heat loss through the lining and from the kiln shell.

While reducing heat loss through the lining and from the kiln shell with a view to conserving fuel is an important consideration, there are still other important benefits to be derived from insulation. These benefits are the im-

*General Refractories Co., Philadelphia, Penn.

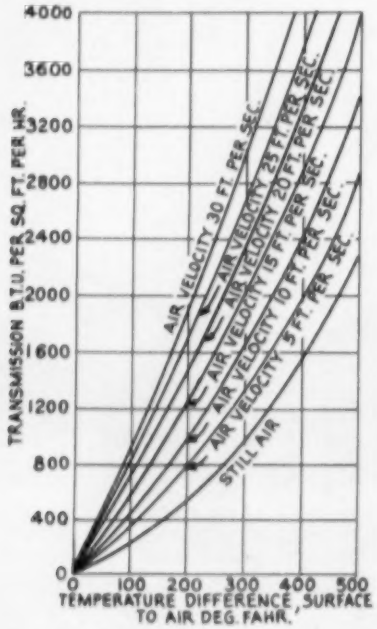


Fig. 1: A.S.T.M. curves to show surface transmission for various velocities of air currents. Air is at 70 deg. F.

Clean-up takes only a few minutes per shovel because of Tournatractor's 19 mph forward and 8 mph reverse speeds. In addition to saving time, speedy tractor-on-rubber keeps loading sites and haul roads cleaner because it can get around to each shovel more times per day than a crawler-tractor.

Kaiser Steel Corp.

speeds pit mine clean-up with Tournatractor

1 rubber-tired rig replaces 2 crawler-tractors

Working their Eagle Mountain Iron Mine, Eagle Mountain, California, Kaiser Steel Corp. find they get more clean-up work done faster with 1 Model C Tournatractor than if they assigned 2 crawler-tractors to handle the same job. The new tractor-on-rubber replaced one full-time crawler, and does the part-time plant and pit maintenance work formerly assigned to a second track-type machine. The change to the faster, more maneuverable 208 hp Tournatractor enables the mine to keep haul units moving with less delays due to spillage or uneven pit floors.

3 to 4 times faster than crawlers

Tournatractor handles all clean-up assignments around 3 shovels. It shuttles back and forth at speeds up to 19 mph, which is 3 to 4 times faster than the top speed of any crawler. In addition, reverse speeds to 8 mph allow unit to back away quickly without interfering with loading operations. Big 21.00 x 25 low-pressure tires provide plenty of flotation and traction. They stand up well despite abrasive and rocky footing around pit floor.

Also used for pulling and pushing

In addition to clean-up and bulldozing, the 208 hp tractor pulls air compressors to drilling sites and moves the frame supports which carry electric cable for shovels, drills, and other equipment.

Get all the facts

Pit owners all around the world are taking advantage of the ease of maintenance, durability, speed, and high production of the Tournatractor. If you are interested in these same benefits for your mine, get all the details from your Distributor today.

Tournatractor—Trademark Reg. U.S. Pat. Off. T-828-M-bww

Tournatractor also cuts downtime for air compressors and other equipment when moving them from one location to another. Tournatractor gets on the job quicker . . . gets to the next assignment quicker. 1500 ft. is less than a minute away.

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

Fig. 3: Results of "slag pocket tests" conducted at 2300 deg. F.

proved internal kiln conditions resulting from insulation.

Geoffrey Martin in his book "Chemical Engineering and Thermodynamics Applied to the Cement Rotary Kiln" states that the quantity of heat absorbed by the solid raw materials in making one pound of portland cement clinker between 32 deg. F. and the clinkering temperature of 2498 deg. F., based on calculations made from data compiled by the British Portland Cement Research Association, is as follows :

In the Drying Zone	70.29 B.t.u.
In the Preheating Zone	534.20 B.t.u.
In the Decarbonation Zone	811.92 B.t.u.
†In the Sintering Zone	286.70 B.t.u.
Total	1703.11 B.t.u.

Thus, approximately 83 percent of the heat absorbed by the raw materials is absorbed before it enters the sintering zone. That is another way of saying that most of the work done on the load material takes place before it enters the sintering or burning zone. It follows, therefore, that anything one can do to assist in the proper conditioning of the load material before it enters the sintering or burning zone is a step in the right direction. And the principal manner in which such assistance can be rendered is to in some way increase the effectiveness of the available B.t.u. that otherwise would be but partially used or wasted altogether. It is largely because of this fact that much attention is now being given to nodulizers, preheaters, heat exchangers, segmentation, baffles to create greater gas turbulence, refractory formed spirals to delay travel of load material through the kiln, etc., for these are all arrangements to provide ways and means to make greater use of the available heat units (B.t.u.) in order to better condition the load material before it enters the sintering or burning zone and at the same time increase kiln production and do so, with no increase in fuel consumption. It is not strange, therefore, that considerable interest is presently being directed to the subject of insulating firebrick for exposed lining in rotary cement kilns, for such linings are also a means of better conditioning load material by making available heat units that otherwise would be wasted, and to do so in the zones wherein most of the total heat is absorbed by the raw material.

Insulating firebrick to be suitable for exposed lining in a rotary cement kiln must possess not only good insulating characteristics but must also have good physical strength, good thermal spall resistance and be able to resist fusion in the presence of load material at the temperature to which it will be subjected Insulating firebrick possessing all such characteristics in ample degree may possibly be available from more than one source, but the only satisfactory one with which the author is familiar is a product that was first introduced to the portland cement industry by the General Refractories Co. a little over six years ago. That took place at the Siegfried, Penn. dry process plant of what now is Dragon Cement Co., Inc. The initial trial installation proved so satisfactory that it was decided early in 1950 to install it in a new 9-ft. diameter by 314-ft. long kiln beginning at a point almost under the feed pipe and extending to 111 ft. from the discharge end. In other words a distance of about 202 ft. All of this lining consisted of 9-in. arch brick to form 4½-in. thick lining. The success of this lining and the excellent overall kiln performance is well known. Suffice it here to say that its use has since been extended to not only other of the Siegfried plant kilns (including the new kiln just completed) but also to the same company's wet process kilns at Thomaston, Maine and to numerous other plants in the United States and Puerto Rico operating over both the dry and wet process.

Any reference to insulating firebrick in what follows will therefore be confined to only that grade with which the author is familiar and now being used or soon to be installed in kilns of the cement companies which are listed on page 105:

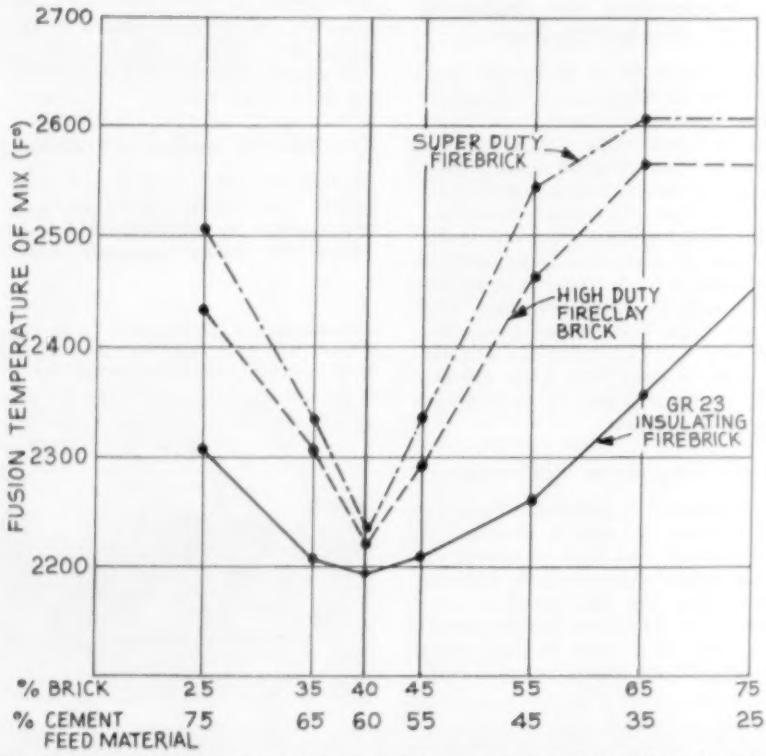


Fig. 2: Curves showing relationship between fusion temperature and mixtures of portland cement raw material with super duty fireclay brick, high duty fireclay brick and insulation firebrick

†The figure of 286.70 B.t.u. is before taking into account 179.93 B.t.u. evolved when chemical union takes place.

D Tournapull Rear-Dump's ability to turn around in only 24'8" enables it to spot fast in tight quarters. With 10 to 11 passes of ¾-yard shovel, unit loads 8 pay yards in about 3 minutes. Big 10'11" x 5'10½" bowl opening, with low rear entry, makes loading easy.

Hauling from pit to crusher, "D's" average 900' distance in 1½ minutes... returning in about 55 seconds. Units' 4-wheel multiple-disc air-brakes assure positive control at all times... give operators complete confidence on winding roads and steep grades.

"Better than trucks where going is tough"

says Superintendent who runs this county quarry

To speed delivery of rock from quarry to crusher, Jackson County Highway Dept. teamed up 2 D Rear-Dumps to handle all crusher requirements.

On the job the "D's" encountered tight loading quarters, rough quarry terrain and underfooting, and adverse grades on haul roads. Unit's speed and maneuverability, plus ease in spotting in restricted places, helped keep crusher well supplied with rock at all times.

1800' cycle in 9¾ minutes

When pictures were taken, the 11-ton "D's" had already moved 28,000 yards of rock to the crusher. Time studies showed that each "D" was averaging 8 pay yds. per load... 1800' cycles were completed in about 9¾ minutes, including 3.65 min. to load and a 3.95 minute waiting time.

"Work in closer quarters"

Comparing the operation of the Rear-Dumps to trucks, Supt. Ralph E. Merritt said, "The D Rear-Dumps are a lot better than trucks where the going is tough." Operator Floyd Sherman added, "'D's' can get around in a lot closer quarters, too."

Safer than trucks

Besides being faster and more maneuverable than ordinary trucks on rough roads, D Rear-Dumps are also safer when dumping loads. Front-wheel-drive on "D's" keeps power and traction on solid footing well ahead of rear wheels. Because body does not need to clear frame, springs, axle, or differential, its center of gravity stays low, even during dumping. Over-size multi-disc air brakes — with more braking surface on one wheel than comparable-size trucks have on all four — prevent creeping or rolling, especially when dumping.

If you have a tough hauling job... better check D Rear-Dump's advantages for yourself. See how the 11-ton "D", 22-ton "C" or new 35-ton "B" can help you.

Tournapull—Trademark Reg. U. S. Pat. Off. DB-903-P-bw

At crusher, "D" dumps 8-pay-yard load in 20 seconds. Operator Floyd Sherman said, "You can get around in a lot closer quarters with 'D's' than you can with a truck." He added, "These D Rear-Dumps are not as hard on the operator as many other types of haulers."

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

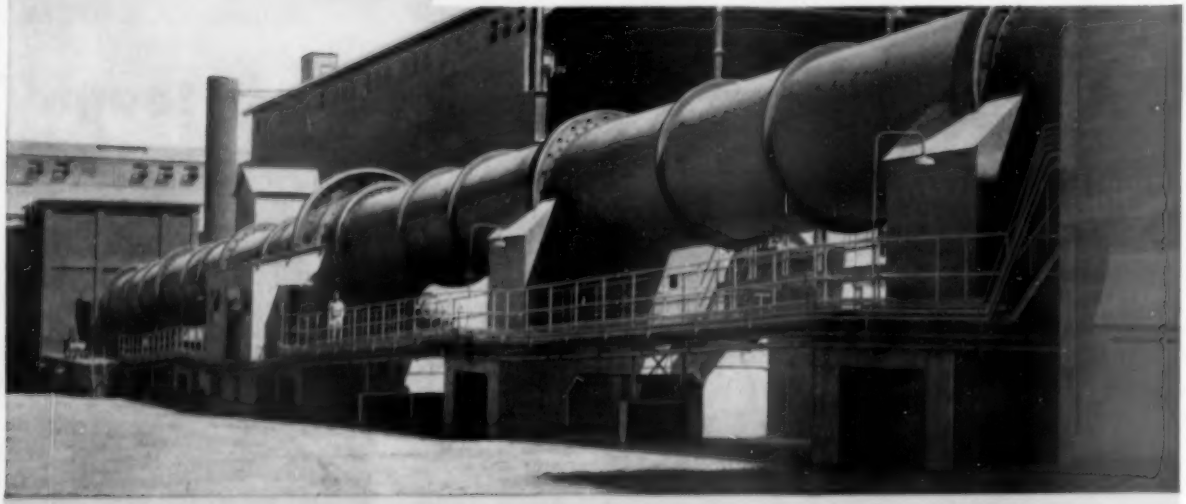
Let's talk EXPANSION

Have You Thought About What Could Be Done to Increase Plant Capacity . . . and Lower Production Costs?

Expansion planning differs from plant to plant. In some operations, meeting increased capacity requirements calls for complete replacement of out-moded equipment.

In other operations, the answer lies in supplementing existing equipment or developing a more efficient flow of materials. Such expansion might call for more grinding or burning capacity. It could require better heat recovery or faster clinker cooling. Maximum fuel utilization, lower power consumption and reduced maintenance are other important considerations.

Regardless of your expansion requirements, Allis-Chalmers engineering assistance and industry-proved equipment can help you provide the desired increase in production at the lowest possible cost.



Allis-Chalmers engineering improvements make the application of the A-C rotary kiln the most efficient method of pyroprocessing. Patented heat-recuperating system saves fuel. Air cooled discharge end keeps kiln end round and rigid. True circle, all-welded construction insures best lining fit, long refractory life. Twenty-degree involute spur gears spread driving force equally. Floating-type riding rings provide adequate support and proper weight distribution.

When you call on Allis-Chalmers for assistance, you get the benefit of more than half a century of experience in developing and applying equipment for the cement, mining and rock products industries all over the world. For information contact your nearby A-C sales office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4724

Kilns, Dryers, Coolers

Grinding Mills

Vibrating Screens

Crushers

Over half of all cement manufactured in the U. S. is processed in Allis-Chalmers equipment.

ALLIS-CHALMERS

KILN INSULATION

(Continued from page 102)

	Process
Dragon Cement Co., Inc., Siegfried, Penn.	Dry
Dragon Cement Co., Inc., Thomaston, Me.	Wet
Universal Atlas Cement Co., Northampton, Penn.	Wet
Universal Atlas Cement Co., Buffington, Ind.	Dry
Universal Atlas Cement Co., Fairborn, Ohio	Wet
Missouri Portland Cement Co., Sugar Creek, Mo.	Dry
Missouri Portland Cement Co., Prospect Hill, Mo.	Wet
Ponce Cement Corp., Ponce, Puerto Rico	Wet
Marquette Cement Mfg. Co., Rockmart, Ga.	Dry
Allentown Portland Cement Co., W. Conshohocken, Penn.	Wet
Medusa Portland Cement Co., York, Penn.	Wet
Southwestern Portland Cement Co., Victorville, Cal.	Wet
Permanente Cement Co., Permanente, Calif.	Wet
Alpha Portland Cement Co., St. Louis, Mo.	Wet
Canada Cement Co., Winnipeg, Manitoba, Canada	Wet
Canada Cement Co., Exshaw, Alberta, Canada	Wet
Cementos Vera Cruz, S.A., Orizaba, Mexico	Dry
Lone Star Cement Corp., Greencastle, Ind.	Wet
Lone Star Cement Corp., Bonner Springs, Kan.	Wet
Ideal Cement Co., Devil's Slide, Utah	Wet
Riverside Cement Co., Oro Grande, Calif.	Dry
Ash Grove Lime & Cement Co., Louisville, Neb.	Wet
Huron Portland Cement Co., Alpena, Mich.	Dry
Penn-Dixie Cement Corp., Petoskey, Mich.	Wet
Aetna Portland Cement Co., Bay City, Mich.	Wet
Keystone Portland Cement Co., Bath, Penn.	Wet
Standard Lime & Cement Co., Martinsburg, W. Va.	Wet
National Portland Cement Co., Brodhead, Penn.	Wet

The insulating firebrick referred to is essentially nothing other than a good grade refractory fireclay brick with a large percentage of open pore space. Recent typical chemical and physical properties are as follows:

Chemical Analysis

SiO_2	61.02 percent
Al_2O_3	32.58 percent
Fe_2O_3	1.48 percent
CaO	0.61 percent
MgO	0.55 percent
TiO_2	1.64 percent
Alkalies	1.49 percent

Physical Properties

Pyrometric Cone Equivalent 31
Corresponding softening point 3056 deg. F.
Weight per 9- x 4½- x 2½-in. straight 2.75 lb. max.
Bulk Density (A.S.T.M. C134-41) 47 lb./cu. ft.
Thermal Conductivity: (BTU/sq. ft./hr./deg. F./in. thickness)

500 deg. F. mean temp.	1.73
1000 deg. F. mean temp.	2.31
1500 deg. F. mean temp.	2.89
2000 deg. F. mean temp.	3.47
2200 deg. F. mean temp.	3.72

Cold Crushing Strength (A.S.T.M. C93-46) 430 lb./sq. in.
Modulus of Rupture (A.S.T.M. C93-46) 160 lb./sq. in.

While the fusion temperature of the insulating firebrick is high (3056 deg. F.), it should be remembered that this is the temperature at which the brick begins to show signs of fusion when subjected to no other attack than simply high heat. In a rotary cement kiln the brick must not only possess high refractoriness, but it must also be able to resist attack by the load material at high temperature, which is a very much different condition than attack by high heat alone. In that respect the brick can be likened to ordinary ice which while a solid at 32 deg. F. will readily melt when covered with salt. However, it has been proven in service, as well as in the laboratory, that this insulating firebrick can be employed in a rotary cement kiln at temperatures almost as high as are safe for regular high duty fireclay brick and super duty fireclay brick; namely, in locations where the hot face temperature of the lining will not exceed about 2200 deg. F. The results of laboratory tests to prove this point are illustrated in Fig. 2 and Fig. 3.

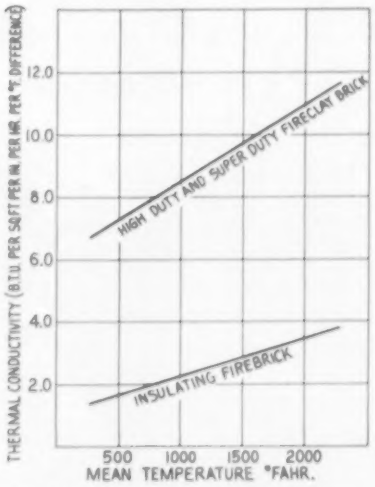


Fig. 4: Curves comparing thermal conductivity of insulating firebrick with that of high duty and super duty fireclay brick

Fig. 2 illustrates by means of curves the fusion temperatures determined on mixes of a typical portland cement raw feed material mixed with insulating firebrick, high duty fireclay brick and super duty fireclay brick, the latter two being brick that are widely used for rotary cement kiln lining. Note that the fusion temperature of the low fusing mix is quite the same in each case.

Fig. 3 illustrates the result of "Slag Pocket Tests" made, using the same portland cement raw feed material and the same three grades of brick used in the fusion temperature tests. The holes in each brick were 2 in. in diameter with vertical sides ¾-in. deep and a conical bottom. The raw feed material was moistened to improve its packing characteristics and 100 gm. of this material tamped into the pockets. The specimens were fired to 2300 deg. F. in an electric kiln, using 3 hr. to reach this temperature and then held at that temperature for 5 hr. After cooling, the specimens were cut in half through the center of the pocket and photographed. As can be seen in the illustration there was no reaction of the feed material with any of the brick. The insulating firebrick resisted attack every bit as well as the high duty fireclay brick and the super duty fireclay brick.

The portland cement raw feed material used in the foregoing tests was furnished by a well-known Eastern cement manufacturer and analyzed as follows:

Ignition Loss	35.20 percent
SiO_2	12.22 percent
Fe_2O_3	1.73 percent
Al_2O_3	4.14 percent
TiO_2	0.25 percent
CaO	42.29 percent
MgO	2.84 percent
Alkalies	0.79 percent

Typical chemical analyses and physical properties of the brick used in the tests are as follows:

	Insulating Firebrick	High Duty Fireclay Brick	Super Duty Fireclay Brick
SiO_2	61.02 percent	55.92 percent	51.92 percent
Al_2O_3	32.88 percent	40.39 percent	43.37 percent
Fe_2O_3	1.48 percent	1.41 percent	0.97 percent
CaO	0.61 percent	0.46 percent	0.45 percent
MgO	0.55 percent	0.38 percent	0.55 percent
TiO_2	1.64 percent	2.06 percent	2.19 percent
Alkalies	1.49 percent	—	—
Pyrometric Cone Equivalent	31	32-33	33
Degrees Fahrenheit	3056	3092-3173	3173
Open Pores	71.98 percent	20.33 percent	19.90 percent
Closed Pores	0.37 percent	0.74 percent	1.00 percent
Total Pores	72.35 percent	21.07 percent	20.90 percent
Modulus of Rupture (lbs./sq. in.)	183	1215	1010
Modulus of Elasticity (1×10^{-6} lbs./sq. in.)	0.295	2.84	2.37
Thermal Conductivity: (BTU/sq. ft./hr./deg. F./in. thickness)			
500 deg. F. mean temp.	1.73	7.25	7.25
1000 deg. F. mean temp.	2.31	8.50	8.50
1500 deg. F. mean temp.	2.89	9.70	9.70
2000 deg. F. mean temp.	3.47	10.90	10.90
2200 deg. F. mean temp.	3.72	11.42	11.42

The foregoing Thermal Conductivity values are shown as curves in Fig. 4.

Obviously, the lower the conductivity of the kiln lining material the lower the kiln shell temperature and heat loss. Based on the above relative conductivities of the insulating firebrick and fireclay brick, shell temperatures and heat loss were calculated following the procedure for such determina-

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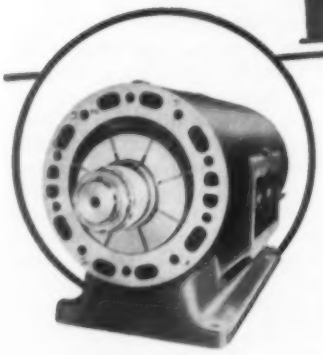

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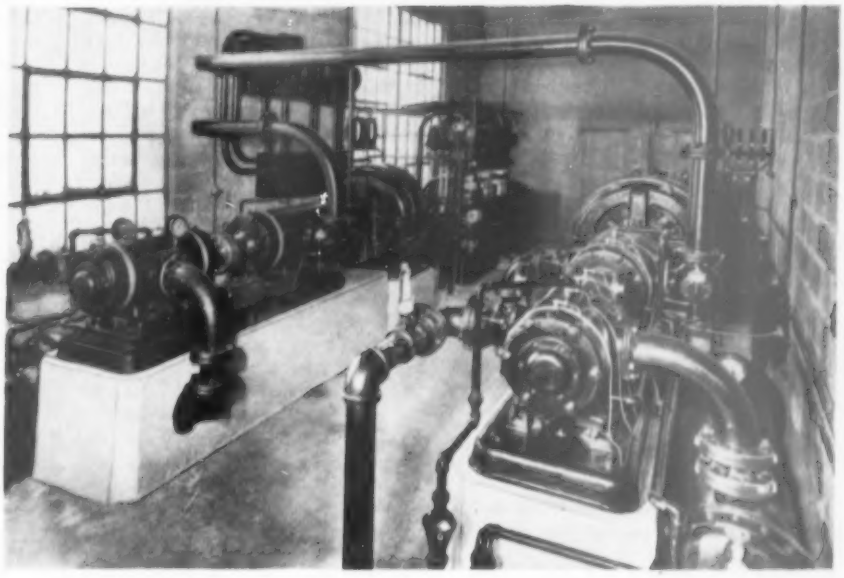

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KILN INSULATION

(Continued from page 105)

tions outlined in the American Society for Testing Materials manual dated February 1952. The results are shown in Fig. 5. These results should only be considered as relative values for they do not take into account the several variable factors that are present in actual practice — factors such as velocity of surrounding air, shape and condition of kiln shell surface, etc. However, our own experience with numerous different types of furnaces and different kinds of lining materials has shown that comparisons of theoretically calculated outer furnace wall temperatures check very close to those determined in actual tests. One good example of this has just recently been reported in connection with a rotary cement kiln in a well-known western plant where a relatively short section of 4½ in. thick insulating firebrick lining was installed between sections of 9 in. thick high duty fireclay brick lining. During the first four months of operation, kiln shell temperatures were taken each Monday morning. The average temperature of the shell lined with the 4½ in. thick insulating firebrick lining was 210 deg. F. whereas the kiln shell temperatures opposite the 9 in. thick high duty fireclay brick lining (taken but a few feet from the insulated section) averaged 285 deg. F.

The data given in Fig. 5 illustrate the material reduction that can be effected in kiln shell temperature and B.t.u. loss if insulating firebrick lining is substituted for the same thickness of conventional fireclay brick lining. It illustrates also that if 4½ in. thick insulating firebrick lining is substituted for 9 in. thick fireclay brick lining, kiln shell temperature can be reduced by 22 to 30 percent and B.t.u. loss reduced by 39 to 54 percent. Note also that the percentage of B.t.u. reduction increases as temperature on the hot face of the lining decreases. This comparative data on 4½ in. thick insulating firebrick lining versus 9 in. thick fireclay brick lining should be of special interest to those rotary cement kiln operators who have been using 9 in. thick fireclay brick lining instead of the more conventional 6 in. thick fireclay brick lining for the purpose of gaining greater insulating effect in the zones ahead of the burning zone.

It is reasonable to expect that the B.t.u. saved as a result of using insulating firebrick lining will be available to do useful work on the load material as it moves down through the kiln. That should be true even if a sizable percentage of the saved B.t.u. is carried away by the hot gases as they leave the kiln. And, of course, the longer the section of kiln that can be lined with insulating firebrick the greater will be the amount of saved B.t.u. available to do useful work within the kiln.

Thus, when discussing insulating firebrick for exposed lining in a rotary cement kiln the questions most frequently asked by those contemplating its use are the following:

1. How long should the lining be and what should be its position in relation to the discharge end and feed end of the kiln?
2. How thick should the lining be?
3. What are the advantages to be gained?
4. What lining life can be expected?
5. Are there any disadvantages to using exposed insulating firebrick linings?

Until actual comparative data becomes available on large scale tests made over a period of time on altogether similar kilns operating under similar conditions within individual plants, these questions can only be answered in general terms.

(To be continued)

TEMPERATURE °F ON HOT FACE OF LINING		2200		2000		1500		1000		500	
ASSUMED SURROUNDING AIR TEMP.-°F		70°F STILL AIR		70°F STILL AIR		70°F STILL AIR		70°F STILL AIR		70°F STILL AIR	
LINING MATERIAL	LINING THICKNESS	SHELL TEMP	BTU LOSS PER SQ.FT. PER HR	SHELL TEMP	BTU LOSS PER SQ.FT. PER HR	SHELL TEMP	BTU LOSS PER SQ.FT. PER HR	SHELL TEMP	BTU LOSS PER SQ.FT. PER HR	SHELL TEMP	BTU LOSS PER SQ.FT. PER HR
GR 23 INSULATING FIREBRICK	9"	275	550	255	470	210	310	160	180	110	65
GR 23 INSULATING FIREBRICK	6¾"	320	720	300	640	240	400	180	220	115	85
GR 23 INSULATING FIREBRICK	6"	330	790	310	690	250	455	190	245	120	90
GR 23 INSULATING FIREBRICK	4½"	390	1070	350	930	285	590	210	320	130	110
FIRECLAY BRICK	9"	500	1760	470	1530	385	1100	290	600	185	240
FIRECLAY BRICK	6"	610	2540	580	2190	455	1460	345	840	210	320

Fig. 5: Kiln shell temperature and corresponding B.t.u. loss for different thicknesses of insulating firebrick and fireclay brick

Construction Outlook

MELVIN H. BAKER, chairman of the board, National Gypsum Co., Buffalo, N. Y., expects company sales during 1956 to increase about 18 percent over 1955 sales, and business in general, throughout the country, to be greater than in 1955. Housing starts, according to Mr. Baker, will be about 1.2 million, and the construction industry will set a new record and help increase the total cost of goods and services well over the $400 billion mark. He asserted that recent gloomy predictions about 1956 home building are "unfounded." "While the number of homes started in the United States next year probably will be fewer than this year," Mr. Baker observed, "the dollar volume of housing will be about the same or slightly higher. This will be because the homes will be larger." The shortages in the construction industry will be relieved by new productive capacities, according to Mr. Baker. "However, in some lines, including gypsum and insulation board," he said, "shortages probably will continue through the first half of 1956."

Mr. Baker listed factors spurring the home building industry as follows:

1. National peace and prosperity.
2. Continued shifting population.
3. Slum clearance and redevelopment.
4. The need for schools, hospitals and other public buildings.

National Gypsum's profits for 1955 are expected to set a new high, and sales will be about $150,000,000, up $23,000,000 over 1954. He noted the completion of five new plants in 1956 to bring the company's total to 39. These are a gypsum products plant at Burlington, N. J.; a paint plant at Raritan, N. J.; a plant at Anniston, Ala., to manufacture paper for gypsum products; a fiber insulation board plant at Mobile, Ala.; and the fifth plant at Westwego, La., producing gypsum products.

Texas Cement Plant

TEXAS PORTLAND CEMENT CO.'S new plant at Orange, Texas, is scheduled for completion within six months, producing 1500-bbl. of cement daily. The plant's proposed marketing area lies within a 150-mile radius of the plant, and will include the Gulf Coast and the lower East Texas area, including Beaumont, Port Arthur, Baytown, Houston, Texas City, Galveston, Freeport, and to the north, Lufkin and Nacogdoches. The Louisiana area served will include Lake Charles, Lafayette and Alexandria.

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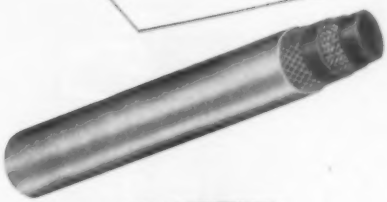

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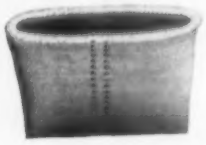

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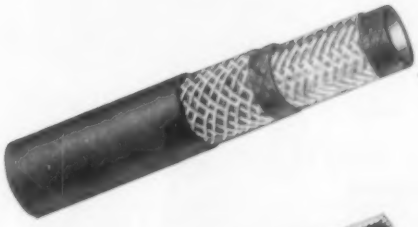

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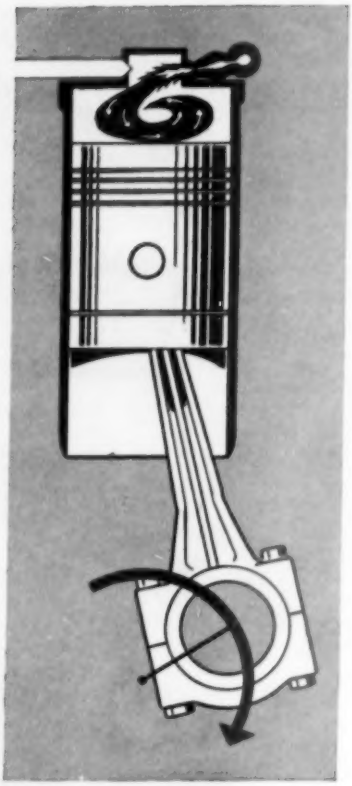

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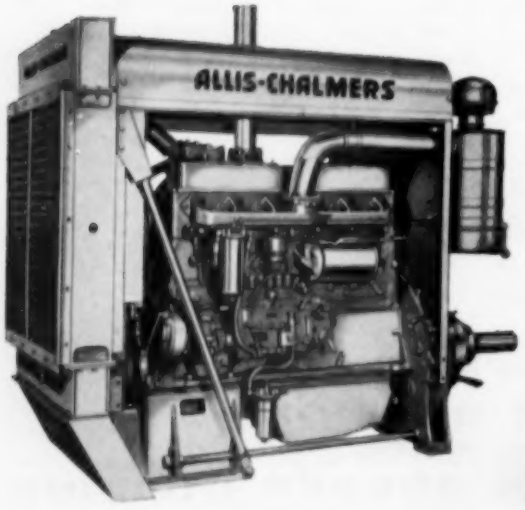

Five sizes of Allis-Chalmers diesel power units —ranging from 15 to 197 brake hp—are available as open style or complete self-contained units. They are compact and easily installed on donkeys, saw and planing mills, etc.

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779 cu in. displacement

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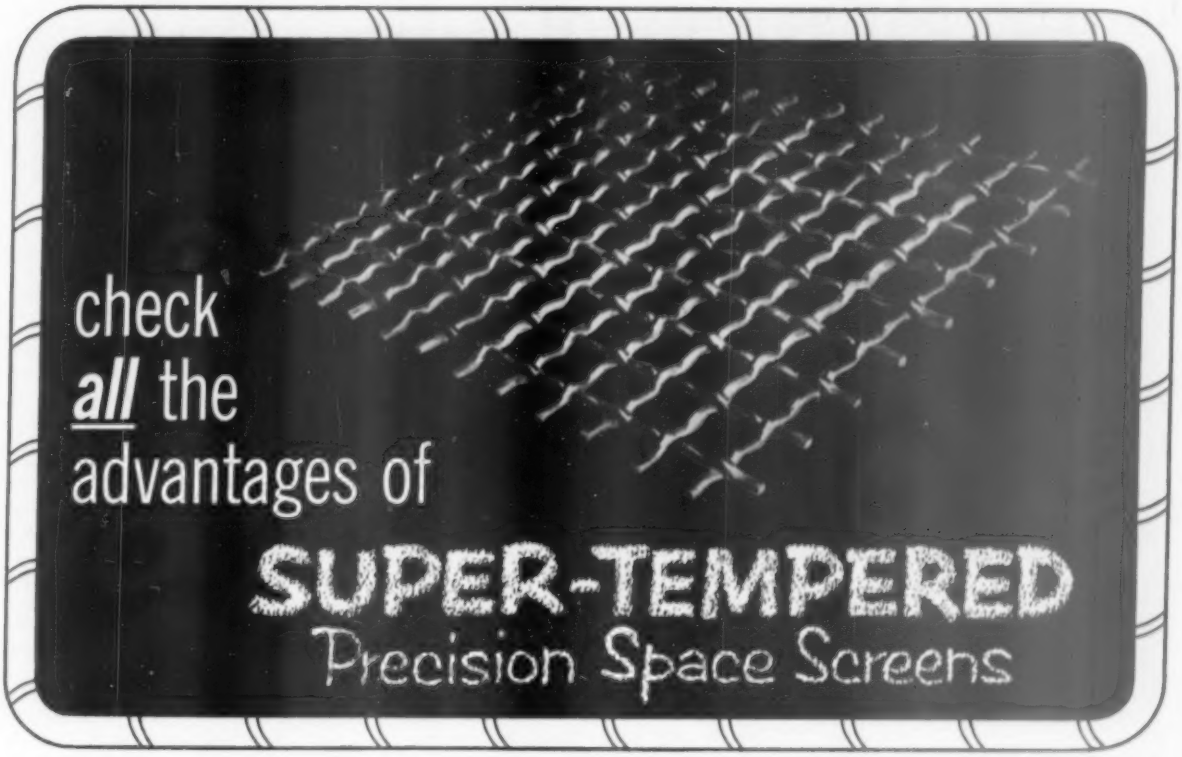

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. . . on methods of manufacturing slag products, with particular emphasis on European progress and practices, starts in this issue. This series should be of value not only to processors of slag but also to cement manufacturers

By B. M. PEARSON*

DEVELOPMENT OF THE SLAG GRANULATION PROCESS was brought about to obtain a granular product which could be easily handled from the fluid slag. Suitability of slag sand for application as a bonding and cementing medium was very quickly discovered, and it was found that the hydraulic characteristics are dependent on its vitreous constituents. To prevent a crystallization, the most commonly used method is to rapidly cool the slag with water, generally known as wet granulation.

The simplest form of the wet granulation process is that which was employed by the Ilseder Huette steel works. The slag stream falls into a water basin which is enclosed on all sides and so arranged that the slag stream falls from such a height that a quick immersion of the slag is ensured. The steam which is generated is passed away above the blast furnace platform by a large chimney. A bucket conveyor passes the slag sand from the granulating basin into a bunker. This granulating process has, in practice, proved to give very good service, scarcely requires any specially skilled labor and what is very important, delivers no hot waste waters, contaminated with slag granules.

Only as much fresh make-up water is passed to the granulating basins as is evaporated with the granulation of the slag. This process is sufficient for basic converter (Thomas) raw iron slags and it delivers a uniform grained sand. With hot, basic slags, the make-up water must be passed in as pressure water and to such an extent and in such a manner that the water stream and the slag stream meet at the surface of the water in the granulating basins, in order to expedite the immersion of the slag which tends to foam. The slag sand granulated in this manner from Thomas raw iron slag has 14 to 20 percent moisture.

A very similar process is termed water granulation, in which the fluid slag falls from the slag spout into a water spout which is lying below. With sudden cooling, the slag explodes into very small grains. The slag sand so formed is separated from the water and passed to a settling-out basin from which it is discharged by means of clamshells or a bucket elevator. By far the greatest portion of steel mills operate according to this method. In the case of the granulation processes operating only under water, the granulation basin should not be too short, as otherwise the time in which the slag-water volume traverses through the basin, is not sufficient to cause granulation and cool off the slag stream sufficiently.

If the granulation basin is too short, then the granules will not be uniformly fine-grained and also coarse grains with bloated particles will be in evidence. If the requisite sharp quenching is lacking, then the slag sand will also not be absolutely glassy, but it will always contain a greater portion of devitrified constituents. As an example, there are given in Table I the values for two slag sands which were granulated at the same steel mill in granulating basins of varying lengths. The sands were produced from Siemens-Martin pig iron slags which did not greatly vary in their chemical composition.

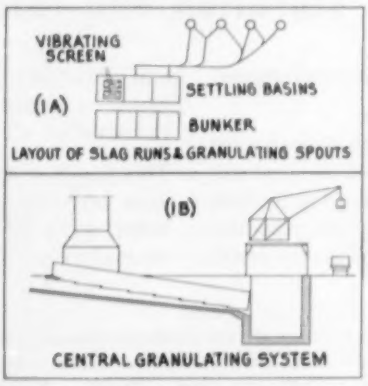

Fig. 1: Arrangement of granulating layout

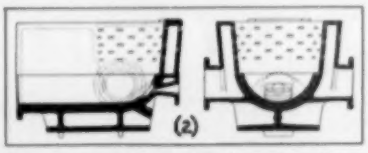

Fig. 2: Spray head for slag granulation (W. Kramer)

The granulation spouts can be arranged, either each one in a collecting basin or also grouped in a common collecting basin (Fig. 1a). From here the sand can be loaded with a clamshell into a storage bunker, where a part of the retained water can drain away. The water is cleaned in the collecting basin and subsequently passed away. For this cleaning purpose, it is passed over two vibrating screens or a drum screen. The sand in suspension which is held by the water is separated out and retained on the screens and passed on to a catch-sump, from which it is removed with a clamshell.

The wet content of the slag sand amounts to 25 to 30 percent. The granulation spouts are constructed for the first 6 to 10 meters of cast iron and are provided with iron lining pieces. The remaining part of the spout is lined with fused basalt slabs. These spouts show hardly any wear. In order to pass the slag sand from all the blast furnaces through a granulation spout into a common collecting basin, the bed of the hot blast stoves must be bridged over with the spout runs. As the drop is not sufficient, the slag sand is passed on further by armored pumps. The granulated blast furnace slag is now passed on to the pumps directly by means of a small collecting container and a screen-grate with about 50 to 60 mm. spacing.

The central granulating layout in Fig. 1b consists of a granulating spout, the collecting basin, the crane equipped with clamshell and the venting tower. In addition to the main water stream,

*Saxonhurst, North Bank, Hassocks, Sussex, England.

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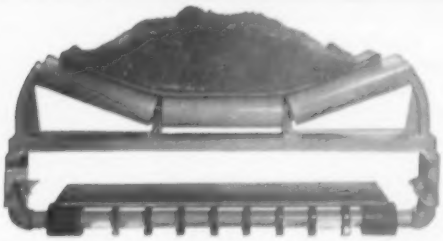

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SLAG PRODUCTS

(Continued from page 112)

which lies as an under-water coating on the floor of the spout, water flows from above and from the side walls of the spout. The slag stream is there-

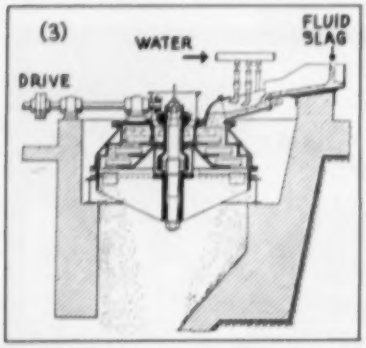

Fig. 3: Granulation mill (E. Opderbeck)

by mixed more thoroughly and the foam-bloating-slag is disintegrated so that the slag particles come into better contact with the water and are more strongly quenched.

The granulation spout is so constructed and designed that it does not present a smooth running surface but it consists of a spout assembled in sections which overlap. In this way, the slag-water stream on its way to the basins must jump from step to step, and it is continually in turbulence so that the slag which is still foaming and bloating is continually being disintegrated and cooled.

To feed the granulation spout with a constant slag stream, very important in maintaining quality of the slag sand, the slag ladles are fitted with a tap-hole of about 70 mm. clear opening, about 50 cm. above the ladle bottom. Before the granulation, the fireclay stopper by which the tap-hole is closed, is then moved out. The ratio of slag to water volume is given at about 1:10; that is, the production of one ton of slag sand requires in this installation for its preparation and handling to the settling basin, about 10 cu. meters of water. The granulation water has its own arranged circulation. In order to cool it down to a temperature of about 25 deg. C., it is allowed to run out from under the slag sand heap at the longitudinal collecting basin. The water is drained to a large pond at the foot of the heap from which it is returned by pump for reuse in the granulation process. The wet content of the sand amounts to 25 to 30 percent.

In another installation, in which the slag is granulated directly at the blast furnace, it runs into a cast iron spout in which flows a strong water stream. In addition, the slag is sprayed from above by a water nozzle. The spout is only 3 meters in length; after one meter the slag runs over a one meter long static sieve to the spout bottom. Here the greater part of the water is removed from the slag-water stream. The slag sand, which is still red hot, falls from the spout into a self-unloader.

The pressure at which the water passes into the spout, amounts to 6 atmospheres (90 p.s.i.). The water temperature at the inlet is 10 to 20 deg. C. and at the outlet of the spout is 30 to 40 deg. C. Water consumption per ton of slag sand amounts to around 3 cu. meters. Water content is about 20 percent.

A wet granulation process in operation in several steel plants, is characterized by the spray head, which is located before the granulation spout proper, Fig. 2. In addition to the sub-water stream which can be regulated,

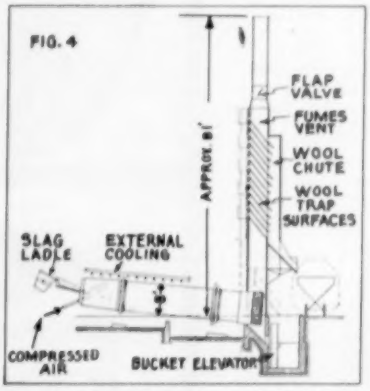

Fig. 4: Granulation drum (G. Jantzen)

any desired amount of water can be added from the spray head, as upper-water.

The slag stream, which is held uniform through an opening of the cover placed on the ladle, pours into the slag granulation head, is then seized by the eddying, foaming mass of water and immediately disintegrated. As the slag particles are eddied around, an immediate, violent cooling is also present. In a central granulation layout with a slag-granulation head, the slag sand-water stream runs through a relatively short granulation spout with a small sump attached and the product is then handled by a bucket elevator with perforated buckets. A great part of the water drops out of the slag through these holes. As the sand passes through this granulation equipment very quickly, it has still so much self-contained heat that a part of the still adherent water is vaporized. At this stage the water content only amounts to 7 to 15 percent. Also, the wear on the slag granulating head is not high. For the granulation of a Thomas slag, in this central granulation layout, about 5.6 to 6.0 cu. meters water/ton of dry slag is necessary. Of this amount, it is split into about 35 percent under-water and about 65 percent upper-water.

Opderbeck Granulating Mill

With the granulating mill, developed at the Schalker Verein der Deutschen Eisenwerke by E. Opderbeck, not only does quenching by water serve as the distributing medium but in addition, there is also the impact of a rotating body, Fig. 3. The Opderbeck mill consists of a cast iron housing of 2.5 m. diameter. A vertical shaft rotates in this housing which, in turn, rotates a three-stepped plate which is provided with adjustable impact angles. The fluid slag runs into the granulating mill through a feed spout. Water is fed into the bottom of the feed-in spout in order to prevent any banking up of the slag.

Before entry into the mill, additional water can now be passed in from above, and under certain circumstan-

(Continued on page 116)

Table 1. Values for Two Slag Sands

Grain Size	Length of Water Spout	
	Over 20 meters	Below 10 meters
Above 25 mm.	0 percent	1.4 percent
10 to 25 mm.	0 percent	3.8 percent
5 to 10 mm.	4.0 percent	10.5 percent
2 to 5 mm.	42.3 percent	61.3 percent
1 to 2 mm.	31.5 percent	13.0 percent
Below 1 mm.	22.2 percent	10.0 percent
Portion of Devitrified Constituents	Below 10 percent	Up to 55 percent

Table 2. Thermal Balance of Slag Granulation Process (Zillgen)

	Test a		Test b	
	k.cal.	Percent		Percent
Brought in				
Slag	45,000	98.3	45,000	98.1
Compressed Air	252	0.5	262	0.6
Nozzle Spray Water	211	0.5	250	0.5
Drum Spray Water	342	0.7	382	0.8
Total	45,805	100.0	45,894	100.0
Passed Out				
Granulate	10,000	21.8	10,000	21.8
Part Compressed Air	645	1.4	612	1.3
Steam from Nozzle Spray Water	6,400	14.0	6,500	14.2
Drum Spray Water	10,400	22.7	10,000	21.8
Portion of Air Sucked in and lost by Radiation and Conduction	18,360	40.1	18,782	40.9
Total	45,805	100.0	45,894	100.0

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Pans, for example, overlap and interlock to provide added stability and stop leakage and spilling. Upturned end flanges also reduce loss of material. Drive links are cast as an integral part of the pan, so there are *no bolts or rivets that can loosen.* Easily replaced link bushings need no lubrication.

Sprocket teeth are readily reversed or replaced without taking the sprocket hub from the shaft or even disconnecting the pans. Like all other wearing parts, these teeth are cast from special wear-resistant manganese alloyed steel.

Supporting rollers and shafts can be removed, too, without disturbing the pans.

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2. Feeder can be made to run in either forward or reverse direction.
3. Available in standard widths up to 84", widths in excess of 84" by special order, and lengths as required.
4. Made with 6", 9", 12" or 15" pan pitch (depending on width) to fit available head room.

PIONEER-ORO FEEDER
Capacities in tons per hour

Travel per Min.	Width of feeder						
	30"	36"	42"	48"	60"	72"	84"
10'	74	108	147	192	300	432	588
15'	112	162	222	289	450	648	888
20'	148	216	294	384	600	864	1176
25'	186	270	368	482	750	1080	1472
30'	223	324	442	577	900	1296	1768

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3. Can manganese parts be replaced without disassembling pans?
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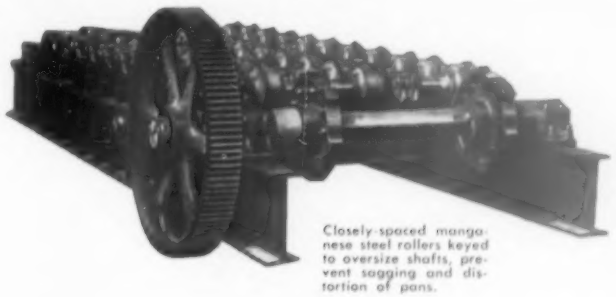

Closely-spaced manganese steel rollers keyed to oversize shafts, prevent sagging and distortion of pans.

Note the turned-up end flanges and corrugated surface of heavy-interlocked pans; also absence of rivets.

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SLAG PRODUCTS

(Continued from page 114)

ces, the water addition in the mill can be automatically regulated by a third water nozzle. The slag running into the mill is caught by the impact angles and thrown against the inner wall. The upper impact angles accordingly take care of the breaking-down of the individual drops and the most rapid cooling through the water. As the space between the impact angle and the mill lining wall is small, the individual slag particles are repeatedly thrown back and forth. The pulverized and cooled slag falls through the spacing cleft between the lining and the rotating plate into a collecting sump, by way of a slide.

With the intimate admixture of water and slag, only as much water is added as necessary for the cooling of the slag. It is possible by regulation of the water feed to hold the sand temperature so high on leaving the mill that the water is almost completely evaporated. The individual parts of the granulating machine are very strongly constructed so that they stand up in this rough work. Any stoppage of the mill by the slag need hardly be feared as the impact effect and centrifugal action of the rotating impact plate is so great and the mill has been designed sufficiently spacious that no blocking and holding-up can occur.

The total weight of the complete mill ready for operation amounts to about 11 tons, the heaviest individual part weighing 3.4 tons. The drive shaft can be placed below or above the mill. The vapors and fumes which are formed during the granulation can be passed off through a chimney.

The mill requires very little room and for this reason can even be placed in the immediate vicinity of the blast furnace. In those plants in which these mills have already been working for many years, the layouts have been arranged as central granulating installations, removed from the blast furnaces. The installation consists of two mills with a chimney in the middle. Both mills work in the rotational direction towards the chimney, so that the fumes can be vented off better. Some granulating mills are also operated in processing Thomas slag, for which only two impact plates are provided with the impact angles. The impact angles also have no additional impact edge-fillets as have the other mills.

The output of an Opderbeck granulating mill of this type amounts to 20 to 25 t.p.h. in continuous operation, including classifying work. The water content of the sands from special raw iron slags, is around 7 percent, and the water consumption at around 0.7 cu. meter/ton. Sand from Thomas raw iron slags has a water content of 4 to 6 percent with a water consumption of about 1.5 cu. meter per ton sand.

Jantzen Granulating Process

Another process for producing slag sand was developed by G. Jantzen at the Buderus iron and steel plant at Wetzlar. This process is designated as dry granulation or air granulation, Fig. 4. The layout includes a revolving drum set at an inclination of about 5 deg. in which the slag feed spout projects. Below this slag feed spout is a compressed air pipe with an air nozzle. The compressed air pipe with the nozzle at the end is so arranged that the slag stream falling from the feed spout is completely caught up by the air blast and is divided up by the compressed air with the addition of a certain amount of water, into a rain of small slag droplets. These slag droplets are directed against the sheet wall of the revolving drum, impinge on this, roll down to the end of the drum, and then fall into a collecting sump. By means of a bucket elevator, the slag granulated in this manner, is passed up into a sand bunker. The vapor fumes which are formed in the drum are passed off by means of a chimney.

The first conical section of the drum is not fixed seal-tight to the other cylindrical sections so that the water which is added for cooling at the entry and which is not evaporated, can run away again. With this granulation process, the necessary cooling is effected by the compressed air needed for the disintegration of the solid slag stream into small particles and the amount of regulated water that is passed in with this compressed air in a finely divided form. In addition to the controllable amount of water passed into the drum and the water which is passed in with the compressed air, it is also vaporized on contact with the hot slag particles and finally by the external air which is sucked into the drum by the chimney. By regulation of the water addition and of the compressed air blown in, the dry granulation of the slag is under complete control. It is also possible to produce a granulate having from one up to 10 percent moisture.

Information has been given by M. Zillgen (Stahl und Eisen, Vol. 45, pp. 533-536) on the thermal balance of the granulating process—see Table 2. The thermal balance which has been worked out is based on the assumption that 100 kg. of hot fluid slag passes 45,000 k.cal. into the granulating system.

The details given indicate that this also is a wet process, naturally with the advantage that without disturbance of the granulating operation, the water feed can be so restricted that a completely dry product is obtained with complete quenching. The air blown in for the granulation, on account of its low specific heat, takes part in the cooling only to a small extent. It has the primary purpose of a mechanical function; namely, that of pulverizing the slag. According to Zillgen, the process is suitable for very acid and also for very basic blast furnace slags. Even highly basic slags with a ratio $\frac{CaO}{SiO_2} = 1.81$, by which the lime con-

(Continued on page 121)

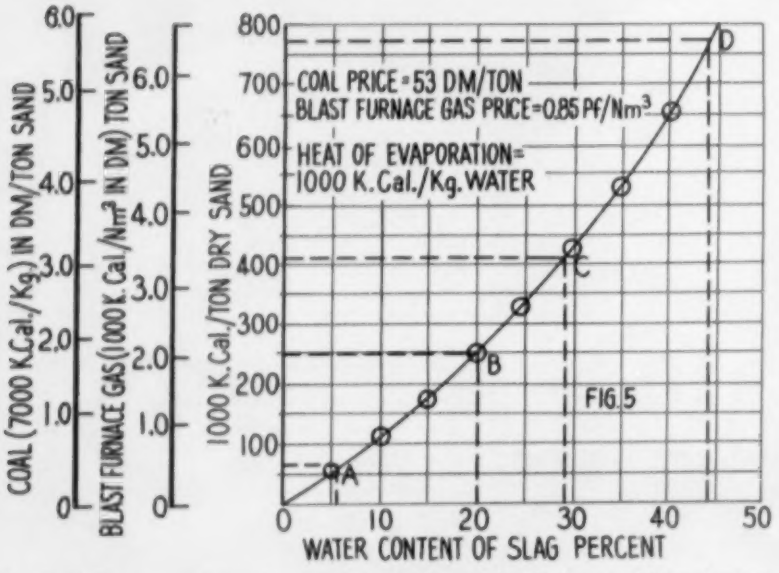

Fig. 5: Heat consumption and costs for drying slag sand with the use of blast furnace gas or coal (Mussgnug)

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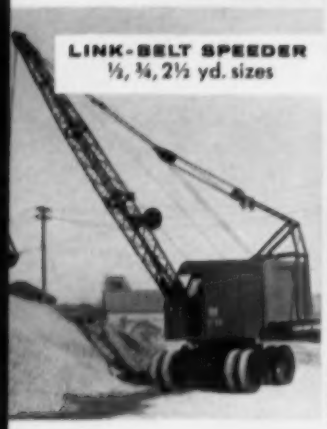

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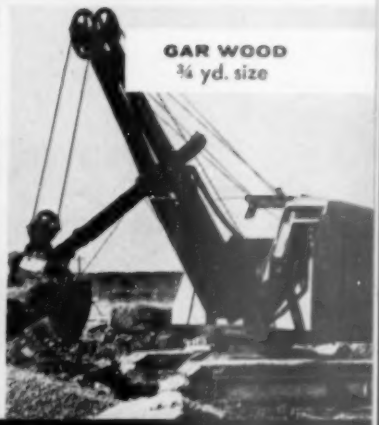

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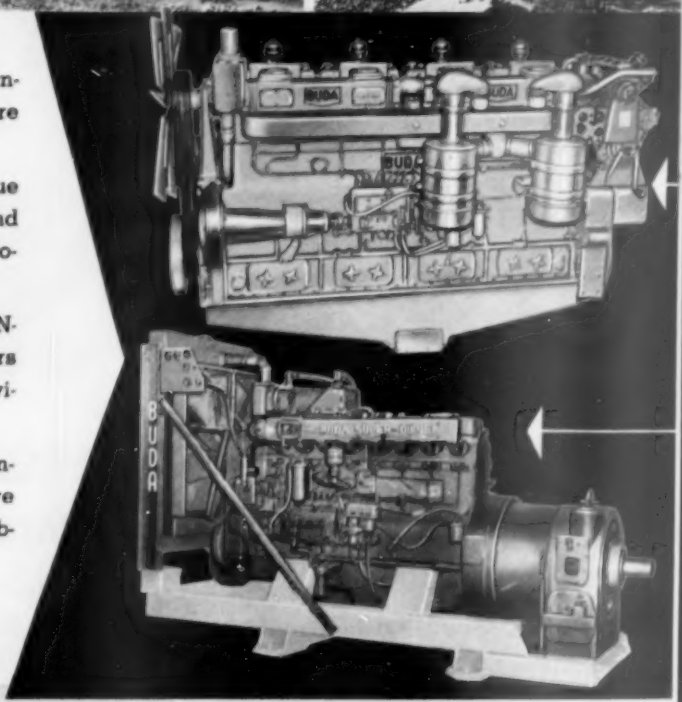

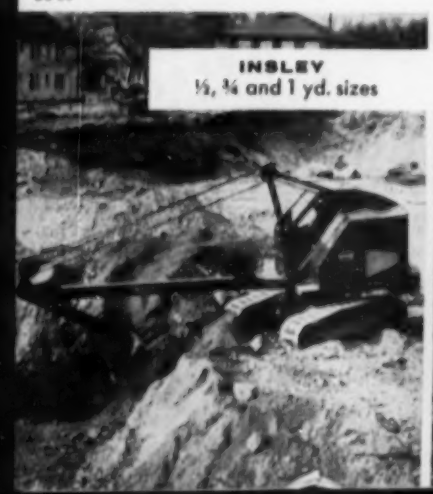

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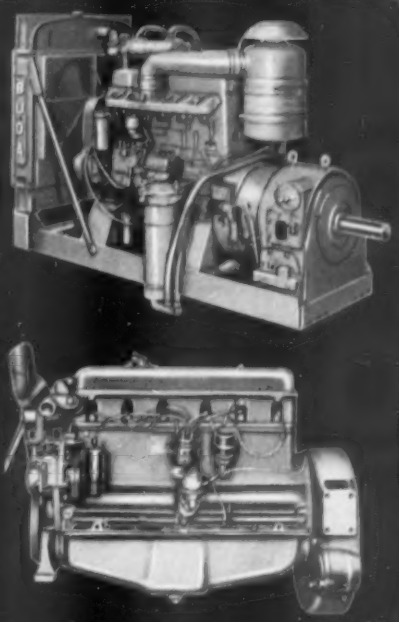

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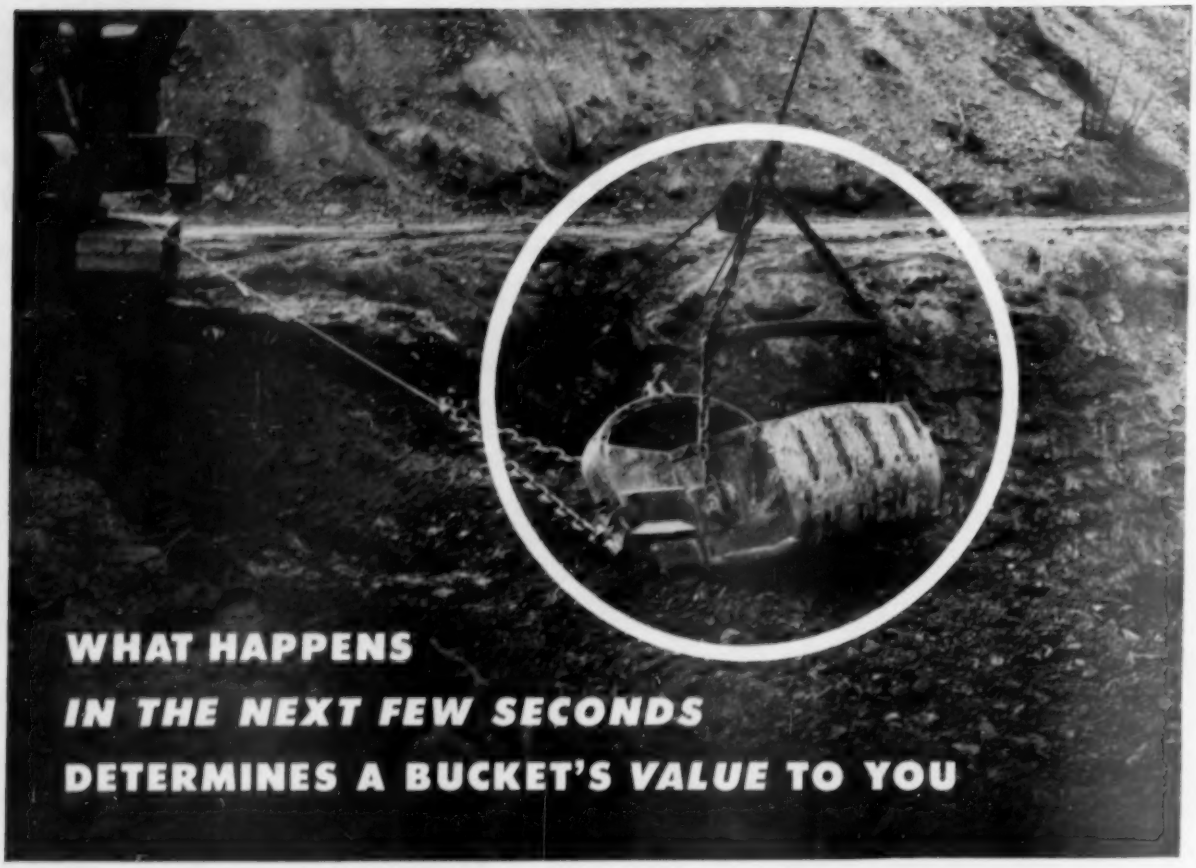

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SLAG PRODUCTS

(Continued from page 116)

tent amounts to 51.58 percent and the silica content to 28.4 percent has been granulated without question. The sand is not purely vitreous, but shows a more or less high crystal content, as the quenching was not apparently powerful enough with the amounts of water and air used. With a wet content of 0 up to 2 percent, the sieve analysis is given as follows:

Above 30 mm.	4.9 percent
20 to 30 mm.	7.6 percent
15 to 20 mm.	4.8 percent
7 to 15 mm.	20.4 percent
3 to 7 mm.	17.1 percent
below 3 mm.	45.2 percent

For one ton of slag 0.15 cu. meter of water are needed. The air requirement amounts to 155N cu. meter/ton sand. The air pressure ranges from 0.20 to 0.35 atmospheres. The labor requirements over 24 hr. for a drum unit requires three drum men and for the morning shift a bucket elevator man is needed who has to care for the cleaning of the venting tower and the general work. The revolving drum itself consists of seven individual sections of which the first, second, and the sixth sections are subjected to the most wear and must be replaced during the course of one to two years.

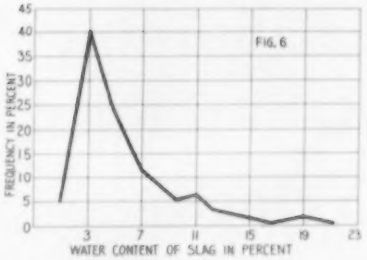

Fig. 6: Water content of a slag sand produced with the Opderbeck mill from Thomas raw iron slag

The drum length amounts to 18.5 m., internal diameter 2.5 m. The hourly output of a drum with continuous operation can be estimated at 20 tons. The maximum hourly output can be put at 25 tons, corresponding to 550 tons/24 hr. The advantage of this process as compared with the wet granulation is that it eliminates any waste waters which can amount to about ten times the weight of the slag being processed. There also is a saving in the clarification space required, and in installations for waste water cleaning, pumps, and cooling layouts.

Slag Sand Characteristics

The hydraulic value of the sand is very important. This characteristic is dependent on the chemical composition of the slag. In addition to the chemical composition, an important role also is played by the pre-treatment of the slag in the development of these characteristics. In addition to the free-running temperature, the temperature of formation and obviously also the temperature present with the granulation of the slag exert a special influence on the hydraulic properties. This was studied by G. Mussgnug (Stahl und Eisen, Vol. 71—1951—pp. 294-297) and established on slag sands which chemically were practically identical. The strength of the cements arrange themselves somewhat according to the formation temperature in the series classification: Thomas (converter) raw iron, steel raw iron, hematite raw iron and foundry raw iron slags.

Hydraulic characteristics are associated with the vitreous condition of the slag sands; i.e., the cooling of the fluid slag must take place so rapidly that no crystallizing-out formation can occur, thus the cooling must be effectively accelerated. If, however, the temperature of the slag has fallen to such an extent by prolonged standing, for example, by transport to the central granulation layout station, that a crystal nucleus formation has already started through an increase in the viscosity, then no completely vitreous

(Continued on page 145)

SLURRY Test Laboratory Determines Friction Loss and Carrying Velocities

By R. E. JACOBY*

FRICTION LOSSES and critical carrying velocities of particular slurries can now be determined in advance with a new slurry test laboratory developed by Morris Machine Works, Baldwinsville, N. Y. The laboratory is especially suitable for analyzing cement slurries.

By running a slurry sample through a 2, 3 and 4-in. line in a closed loop system, friction losses and carrying velocities may be determined with considerable accuracy for the purpose of recommending pump and pipe sizes that will do the job most efficiently. The company is also developing formulae to convert friction losses and critical velocities in model pipe lines to full size prototype lines.

Morris has been furnishing slurry pumps for cement mills from the very beginning of the wet process industry and had developed some rule of thumb formulae to aid in the application of these pumps based on field experience.

In the early years, power was not a factor particularly, and various slurry pumps were generally over-powered.

As the cement industry became more and more conscious of power requirements, Morris developed higher efficiency slurry pumps. Before World War II, it was evident that the next opportunity to make plant installations more efficient was through study of the slurry itself. World War II slowed up consideration of this particular problem, and it was in 1945 that the first test setup was completed.

This first setup was a 1-in. unit with a 1-in. pump and a relatively short glass line to allow us to observe the flow of slurries through pipe lines. This testing equipment was, of course, only a rough start. It was gradually modified and, in 1947, a 1½-in. test loop was compelted.

The data which Morris started to accumulate with the 1½-in. test loop, combined with previous testing data, raised questions which could only be answered by the handling of higher capacities. In 1948, the unit was increased to a 2-in. loop and, in 1950, *was again* increased to a 3-in. loop.

The 3-in. test loop seemed to be about the ideal size for a model, since the equipment was large enough to give good stable readings, and, when combined with field tests, proved quite accurate. The slurry laboratory was further modified and refined until the spring of 1955, when it was moved into its present new quarters.

Chief Engineer R. E. Jacoby and **Test Engineer R. N. Roberts** looking into mirror to check the flow characteristics of a slurry from the bottom side of the 3-in. glass line

*Chief Engineer, Morris Machine Works, Baldwinsville, N. Y.

Operating a swivel elbow, to the left, so that a portion of the slurry can be weighed. To the right, the weight of the slurry is being checked. Note that the uppermost tank is supported on a platform scale. When the weighing tank is full, the swivel elbow is thrown back so that the slurry flows into the stilling tank at the left

Operation of Test Equipment

The new laboratory has a Morris 3-in. type R pump driven by a variable speed d.c. motor. With each particular slurry, the complete performance curve will indicate any variables in the action of the slurry as it passes through the pump. By changing a series of valves, the pump can discharge through either 2-in., 3-in., or 4-in. piping. In each of these lines, there is a measured 18-ft. length of steel pipe and a length of horizontal glass pipe. The slurry then passes through two 20-ft. lengths of rubber hose, one of which is fastened to each end of a length of glass pipe. From here, the slurry passes on through a swivel elbow to the stilling tank, and then to the suction hopper tank, above the pump.

The capacity is checked accurately by the time-weight method. A conical tank, supported on a platform scale, discharges through a plug valve back into the suction hopper tank. To check the capacity, it is only necessary to close the outlet plug valve and move

(Continued on page 126)

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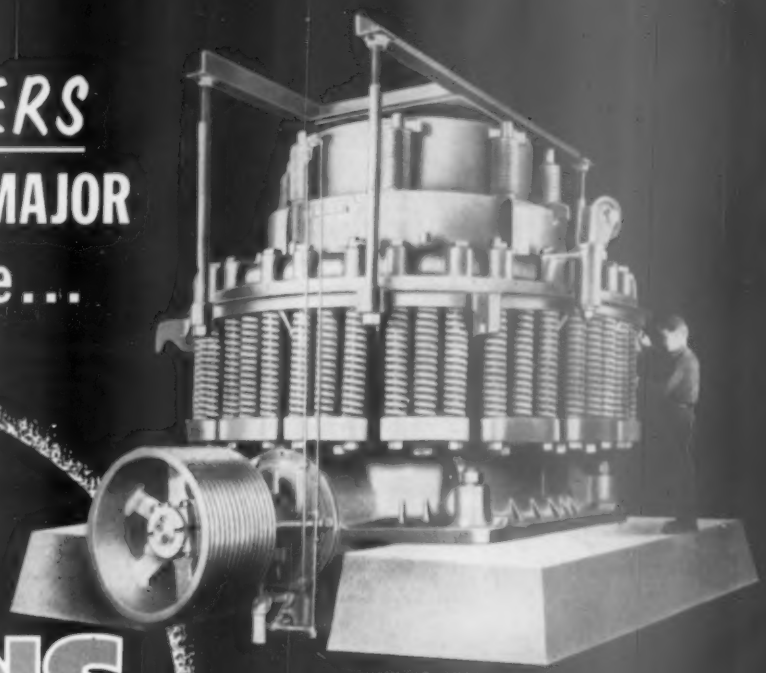

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DIESEL ENGINES

Manages Phosphate Operations

DR. E. T. CASLER has been promoted to manager of the Bartow, Fla., operations of the phosphate minerals division of International Minerals and Chemical Corp., Chicago, Ill. He replaces Floyd B. Bowen who has been appointed production manager for the division's operations in Florida, Tennessee and Montana. A graduate of the University of Florida, Gainesville, Fla., Dr. Casler joined the company in 1942 as staff engineer for the phosphate division and one year later became assistant manager of the Florida phosphate department. In 1944, he received the honorary degree of doctor of science from the University of Florida in recognition of his contributions to the progress of phosphate mining in Florida.

W. O. McClintock has been appointed assistant manager for engineering. He was formerly chief engineer and will be succeeded by H. E. Uhland, chief metallurgist, who will be succeeded by F. J. Clawson, flotation supervisor. H. T. Loehr has been appointed assistant manager for production.

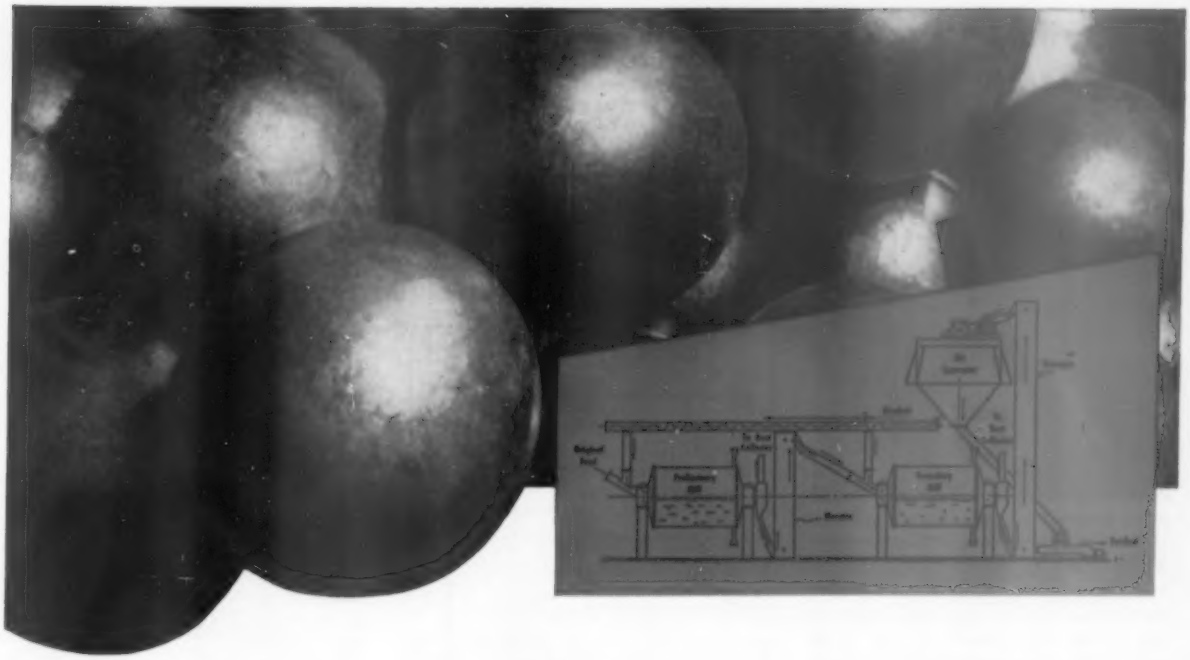
Association Officers

LESTER A. HELGESEN, Footville Lime and Rock Co., Footville, Wis., was elected president of the Wisconsin Aglime Producers Association at a recent meeting held at Madison, Wis. Michael Brisch, Rockwell Lime Co., Manitowoc, Wis., was elected vice-president, and Eddie P. Evenson, Einar Evenson & Sons, Cambridge, Wis., was named secretary-treasurer. Directors include past-president Arthur Overgaard, Arthur Overgaard Co., Elroy; Roger Ivey, Ivey Crushing and Construction Co., Mineral Point; and K. C. Ruedebusch, Mayville White Lime Works, Mayville, Wis.

Principal speakers at the meeting were Prof. C. J. Chapman, extension specialist — soils, College of Agriculture, The University of Wisconsin; Dr. O. J. Attoe, chairman of the department of soils, College of Agriculture, The University of Wisconsin; and Robert M. Koch, executive secretary, National Agricultural Limestone Institute, Washington, D. C.

Assistant Superintendent

DAVID E. STEVENS, JR., was recently appointed assistant superintendent at the Greencastle, Ind., plant of Lone Star Cement Corp., New York, N. Y. He was formerly plant engineer at the Hudson, N. Y., plant. Mr. Stevens received his engineering training at Lehigh University, Bethlehem, Penn., and Cornell University, Ithaca, N. Y.



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3321

R. N. Roberts, test engineer in charge of of the slurry laboratory, checks the manometer to determine friction loss of a particular slurry

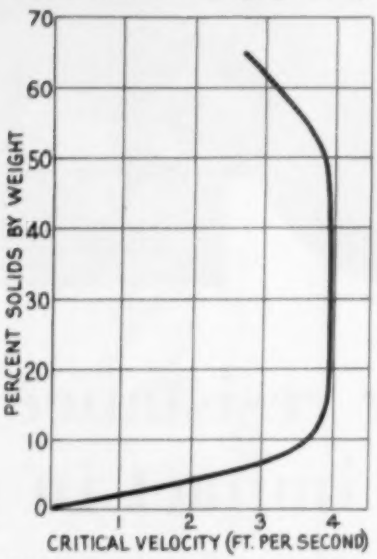
the swivel elbow approximately 90 deg. to divert the flow into the weigh tank. When the weigh tank is nearly full, the swivel elbow is quickly thrown back, so that the slurry flow goes back into the stilling tank and into the system.

Flow time is measured with a stop watch and the weight of the unit can be accurately measured on the platform scales. All materials, both liquid and solid, are carefully weighed into the system so that the specific gravity of the mixture is predetermined. However, sufficient samples are taken from time to time to rule out any errors in specific gravity measurement, since this enters into all of the calculations.

At present, capacity of the system for best testing is approximately 150 gal. of slurry, plus an additional 50 gal. to cover spillage, etc. With the equipment we now have, flow rates as high as 450 g.p.m. can be handled through the system. This provides a wide range of flow conditions for testing purposes.

Friction Loss and Carrying Velocity

In the slurry test laboratory, we are able to measure the friction loss through 2-in., 3-in. and 4-in. pipe lines; and on slurries, where it is a factor, the critical carrying velocity.



Critical carrying velocity curve which is very typical of the critical carrying velocities of cement slurries as they have been run through the test laboratory

Critical carrying velocity is the minimum velocity at which all of the solids will remain in suspension. Combining these two factors will give the most economical installation for the prototype systems.

At each end of the 18-ft. measured sections of steel pipe, a sedimentation trap is connected by copper tubing to a manometer. Depending upon the range of friction losses, we use both mercury and a special Meriam fluid having a specific gravity of 2.95 in the manometer. This gives a wide range to our readings and increases the accuracy.

In order to determine critical carrying velocity, the valves are adjusted so that the flow is through only one size of pipe line. The capacity is very carefully decreased, both by decreasing the speed of the motor and closing a rubber pinch valve at the pump discharge. Readings are taken at intervals as the capacity is decreased; and by watching the glass line, the point just above which the material settles out is considered the critical carrying velocity.

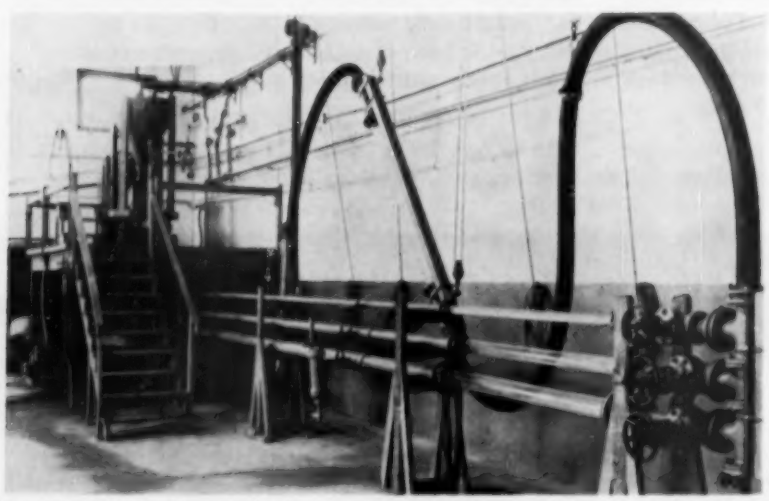
Critical carrying velocity is a function of many variables, such as the size and specific gravity of the solids, shape of the solids, the screen analysis of the mixture, and the percentage and type of fines.

Once the solids have settled out, there are further peculiarities that enter into the results. In some instances, we find that by simply increasing the velocity through the pipeline slightly, the material on the bottom will all pick right back up in suspension. However, we have had instances where the velocity has to be increased a great deal before the solids will go back in suspension. In these cases, if the percentage of solids had been high enough, the lines would most certainly have plugged and would not have cleared themselves. In a field installation where the length of pipeline is relatively long, it can be serious to fall below the critical carrying velocity.

The slurry laboratory has proven its value on jobs where total head is made up largely of friction loss. In one instance a job which initially seemed to require a 200-hp. motor, turned out to be easily accomplished with a 60-hp. motor. This was a case where the critical carrying velocity and the friction loss were combined to work out the most economical arrangement for the customer.

It is also entirely possible that a job originally estimated for about 60 hp. could turn out to require 200 hp. to avoid a plugged line.

In another application, a number of pump manufacturers quoted a rather wide range of recommended pipeline velocities, averaging approximately 8½ f.p.s. In testing the material, we found that it would be necessary to run the slurry in the prototype line at between 18 and 19 f.p.s. to handle it properly. Rather than install equipment to handle the material at this high velocity,



Test laboratory equipment showing the three glass lines at the right and the slurry tanks on the platform to the left

the customer decided to crush it to a smaller size. This crushed material was tested and it was found that a velocity of 14 to 15 f.p.s. would be required to carry it.

The customer felt that this was somewhat conservative, so the plant was designed to handle the crushed material at a velocity of 12 f.p.s. When the installation was tested in the field, the material tended to fall out and it was necessary to increase the impeller diameters and motor sizes on the pumps in order to bring the velocity back up to around 14 f.p.s. to carry the material satisfactorily.

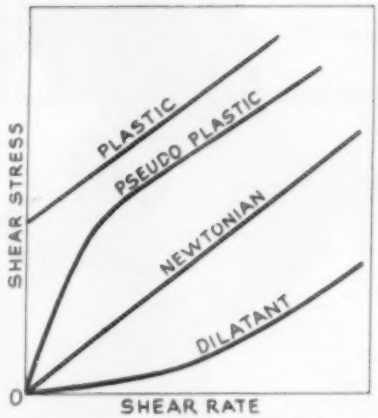
How Slurries Are Run

Slurries are received in the laboratory in both the wet and dry state. Often when the material is sent in dry, the customer is interested in determining how the particular material handles at various degrees of solids. In an instance such as this, we would make first the water run followed by a test run at various increasing percentages of solids such as 2, 5, 10, 20, 30, 40, 50, and 60 percent and higher. We would then determine a friction loss curve for each percentage, and make a curve of critical carrying velocities at these percentages.

By combining these two results, we are able to aid in predicting the most economical range in which to handle this material, together with the most economical pipe size for the required capacity. A typical critical carrying velocity curve might be something as shown in the accompanying curve graph. You will note that as the percent is increased beyond a certain point, the critical carrying velocity decreases. It is therefore evident that combining this information with the friction loss curve would be extremely valuable.

If the particular material sent in is already mixed as a slurry, we run a complete test at this particular consistency. Based on our information from this one test, we would then be able to apply the particular slurry pump.

Through continued use of the laboratory it has been found that the rule of thumb methods of applying slurry pumps, particularly in the heavier concentration slurries such as cement slurries, are extremely inaccurate. Each slurry seems to have its own peculiar characteristics which can only be brought out through actual tests. For instance, limestone slurries from one quarry will react totally different from limestone slurries from other quarries. Oyster shell slurries from one part of the country will differ from shell slurries in other parts of the country. Clay slurries are notoriously different in their characteristics. For example, a 60 percent solids mixture of one slurry will be considerably stiffer than a 70 percent solids mixture of a different clay slurry.



Shear diagram of fluids. Most of the cement slurries run through the test laboratory have shown either plastic or pseudo-plastic behavior

The rather intangible aspects of a slurry, such as how it handles through the pump and system, aid in applying a pump. There are no particular measurements for these intangibles, but they do serve as a guide to the application engineer in working out the most economical installation. It is only through building up a wide background from these tests that we are able to find any similarity between the various slurries.

Predicting Pipe Line Characteristics of Fluids

For some time, an effort has been made to predict pipe line characteristics of non-Newtonian fluids. The accompanying graph shows the shear rate-shear stress relationship between a Newtonian fluid and that of plastic, pseudo-plastic and dilatant fluids. Most of the tests which have been run in the laboratory have been of the non-Newtonian type, exhibiting either plastic or pseudo-plastic behavior. The cement slurries fall into this class.

In laboratory work, Morris uses a Brookfield viscometer to correlate the results of the slurry tests with the shear rate determined by the viscometer. Some correlations have been made which are being checked out by further testing and field tests. To more accurately determine an approximate critical carrying velocity for certain material when at the customer's plant, Morris is attempting to find some correlation between the critical carrying velocity as measured on tests and a free fall velocity of a particular particle. One part of the laboratory is devoted to compiling these free fall data and then attempting to find some correlation to the measured critical carrying velocity. To date, only general assumptions can be made, but the method appears to have considerable merit.

Flow Characteristics of Slurries

In evaluating the flow characteristics of various slurries, an additional valuable aid is the length of glass line connected between the flexible hoses. This particular length of pipe can be rotated on its axis 180 deg. so that the flow of the slurry can be viewed in all pipe positions — from pumping straight down, to horizontal, to straight up vertically. This is a considerable advantage, particularly with slurries of oversized particles.

One particular case had to do with some metallic tailings, in which the customer had found evidence that the material could only be handled horizontally or vertically, but not at any angle. With the flexible sloping line, we were able to show that the material could be handled at any angle; and this resulted in a considerable saving in piping in the customer's plant.

All slurry solids are run through a set of Tyler screens to determine the gradation of the solids. As was previously mentioned, this gradation is quite important to the flow characteristics of the particular slurry.

Through the use of the laboratory, Morris application engineers have extremely valuable tools in applying pumping equipment. It has been found, of course, that with the many differences which are encountered in samples of similar materials, extreme caution must be used in generalizing on the flow characteristics. However, with the wide background of slurry tests, Morris is able to predict much more accurately than prior to having the laboratory. The ultimate, of course, in order to pinpoint a particular application, is to actually test the particular slurry completely in the laboratory.

Each customer is invited to watch these slurry tests in the laboratory, since he can gain a great deal of knowledge concerning the handling of his own particular slurry. This intangible information, together with a formal test report and recommendations make the ultimate in a successful pumping installation.

Japanese Cement Production

THE JAPANESE CEMENT INDUSTRY ranks fifth in the world, as a result of post-war recovery. Production in 1954 amounted to 10,600,000 tons, an increase of 70 percent over the 1939 figure. More than 900,000 tons, or 9 percent of the total production, was exported, primarily to southeast Asia.

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P-1

INFORMATION

TO HELP YOU MEET TODAY'S PROBLEMS AND TO MAKE PLANS FOR TOMORROW

You can obtain catalogs listed on these pages by merely checking and mailing the coupon below

1 AUTOMATIC BAGGING SCALES—Richardson Scale Co. has brought out a six-page bulletin, No. 8246A, describing and illustrating the Model FFFP automatic bagging scales. Three basic styles of the open type net weigher are illustrated for free-flowing materials. Four diagrams show special features, including the hopper door flapper, the inlet chute with positive shut-off, and the accuracy indicator for spot checking. Accessory equipment and optional discharge systems are described in detail.

2 BAG PACKER—E. D. Coddington Manufacturing Co. has issued a brochure containing detailed descriptions of the various models of the Auger-Matic bag packer. Practical applications, accessories, and a cutaway view are included in the brochure.

3 BUILDING MATERIALS CONVEYOR—The Marion Manufacturing Co. has announced Bulletin 551, describing and illustrating the Marion Mule Builders Conveyor. A two-handled steel container is shown for elevating mortar, sand, concrete and other materials. Specifications are also included.

4 CONCRETE COLORS — Frank D. Davis Co. has published a bulletin entitled "Cement Colors", discussing methods of coloring concrete products, and various color properties. Alkali resistance and permanency to light, synthetic and natural mineral colors, adding colors according to concrete weight, etc. are discussed. Information on pigments and quantities required for obtaining various colors and shades in concrete products is also included.

5 CONCRETE SLAB SYSTEM — Rapidex Corp. has issued a catalog describing and illustrating "Rapidex," a Haydite-concrete slab system for roofs and floors. A load design table, heat transmission coefficients, comparative noise reduction coefficients, and typical installation photos are shown.

6 ELECTRIC FORK TRUCKS—Baker-Raulang Co. has released Bulletin 1324, covering the FT-40, 4000-lb. fork truck, and Bulletin 1325, describing the FT-60, 6000-lb. truck. Features, performance specifications, dimensions, control and construction details, and components and available attachments are listed.

7 EXCAVATOR CRANE—Bucyrus-Erie Co. has introduced Bulletin 15-B-4, describing the 15-B excavator crane. On-the-job photographs and closeups of mechanical features are given, as well as complete specifications and working ranges.

8 POUR-WHEEL DRIVES — Napco Industries, Inc., Napco Products Div., has released literature describing Powr-Pak four-wheel drive units for use with General Motors and Chevrolet trucks. Printed in English and Spanish versions, the pamphlets describe various performance features, and lists full specifications.

9 GEAR MOTORS—Link-Belt Co. has announced a 28-page booklet, No. 2447, describing Gearmotors and Motogears. Included are complete selection data together with construction features, load classifications, dimension tables, overhung load ratings and mounting assemblies.

10 HANDLING TECHNIQUES—Clark Equipment Co., Industrial Truck Div., has published studies of handling techniques in ten industries, illustrating various uses of fork trucks and describing new equipment in the Summer, 1955, issue of "Material Handling News." More than 50 photographs illustrate case histories of materials handling methods.

11 HARDSURFACING ALLOYS—Coast Metals, Inc., has brought out literature describing its recently developed line of hardsurfacing alloys, Nos. 80A, 91A, 92A, 96A, and 98A. Composition, welding specifications and characteristics of hardsurfacing deposit are given.

12 HEAT EXCHANGER—The Griscom-Russell Co. has prepared a bulletin describing and illustrating the design and construction of the G-R plate fin exchanger for recovering waste heat from high temperature gases to preheat air or other gases and vapors. Typical applications are listed, and several reproductions of photomicrographs are included.

13 HYDRAULIC MATERIAL HANDLING—Meckum Engineering, Inc. has published a bulletin entitled "Pipe Fittings and Supplies for Hydraulic Material Handling". Information on elbows, pipe nipples, special fittings, flap valves, connections, flanges, couplings, steel pipe, hose clamps, and hose is included. Specifications are given, as well as equipment photographs.

14 HYDRAULIC TESTING MACHINES — Baldwin-Lima-Hamilton Corp. has issued a 12-page bulletin, No. 4401, describing Baldwin-Tate-Emery universal testing machines in capacities from 10,000 to 5,000,000 lb. Standard and special types of vertical and horizontal machines are also described. An illustrated explanation is given on hydraulic loading and the independent hydraulic weighing system, which is based on the Emery cell and the Tate-Emery null-balance load indicator.

15 LOG WASHERS — McLanahan & Stone Corp. has published an eight-page bulletin describing and illustrating log washers for removing clay, soft rock and other refuse from sand and gravel, limestone, etc. In addition to technical details on construction and operation, charts are included, giving dimensions for the various types of log washers.

16 LUBRICATION—The Texas Co. has published Vol. XLI, No. 11, of "Lubrication" devoted to discussion of "Railroad Diesel Fuels and Lubricants." A curve illustrates the growth of diesel locomotive power compared with steam power, and among various photographs are those illustrating the effect of sand removed from piston oil ring deposits on cylinder liner scratching. An analysis of fuels used in laboratory engine tests is also given.

17 MECHANICAL VIBRATING FEEDER—Richardson Scale Co. has announced a four-page bulletin, No. 55C, describing the Velofeeder, a mechanical vibrating feeder. The bulletin outlines the operating principles and specifications of the feeder, which can be electronically synchronized to match the flow-speed of other equipment. Nine photographs show the device feeding a variety of materials, and a full-page engineering drawing details its design.

18 MOTOR-GENERATOR SETS—Allis-Chalmers Manufacturing Co. has released Form 05B8175, entitled "Allis-Chalmers Motor-Generator Sets." Large pedestal-bearing synchronous motor-generator sets for rolling mills, mine hoists, paper machine drives, etc., are described. Standard rating tables for two and three-machine sets are included, as well as motor and generator voltages, special frequencies and special combinations. Various construction features are also described, including the "Frog-Leg" type of armature winding.

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19 **OPENMOUTH BAG FILLING MACHINE**—Kraft Bag Corp. has prepared a brochure on the Kraftpacker, an open mouth bag filling machine. Typical application photographs, operational, maintenance and installation details, and a material flow diagram are included.

20 **PACKING, SHIPPING, HANDLING**—Signode Steel Strapping Co. has issued the Autumn, 1955, issue of "The Signode Seal," featuring articles on developments in shipping paper, special handling rolls of aluminum foil, and how Radio Corp. of America designed a prize-winning corrugated container.

21 **PORTABLE AND UNIT MILLS**—Denver Equipment Co. has published Bulletin M5-B5, entitled "Denver Portable and Unit Mills." Equipment, capacities, and general arrangements for unit and portable truck mills are discussed in the 16-page bulletin. Flowsheets, photographs and general information are given for mills from 5-7 t.p.h., 7-10 t.p.h., 25-125 t.p.h., and 100-200 t.p.h., as well as for the Package Coal flotation unit, portable placer units, portable cyanide mills, portable gold mills and mobile laboratory.

22 **PORTABLE BATCHER** — The Travel Batcher Co. has released a folder entitled "The New 'On The Job' Travel Batcher," describing and illustrating its use as a transfer unit with a production of up to 100 cu. yd. per hr., and as a weigh batcher at 50 cu. yd. per hr.

23 **PORTABLE DRILL** — Pitnam Industrial Products Co. has published literature giving advantages and uses of the gasoline engine or electrically driven Pinazza rock drilling and demolition equipment. Also described is the patented "Centripowered Ram" principle which prevents overloading and permits drilling to depths of 16½ ft.

24 **POTASH PRODUCTION**—Nordberg Manufacturing Co. has published Vol. 14, No. 4, of "Nordberg Progress," magazine, featuring an article entitled "Nordberg Machinery Serves the Potash Industry." Photographs and a material flow diagram are included.

25 **PRECISION RING GEARS** — The Falk Corp. has prepared Engineering Report 6171, by W. P. Schmitter, vice-president and chief engineer, which describes the care required in manufacturing large precision ring gears used to drive mills, kilns, hoists, and other machines. A sequel to Report 6170, it describes the science of producing large ring gears, from the pouring of the casting to the final contact check.

26 **PROTECTIVE COATING** — The B. F. Goodrich Co., Industrial Products Div., has issued a 12-page illustrated catalog on its line of protective clothing. Included is information on a complete line of lightweight Koroseal industrial clothing, including Koroseal-coated canvas gloves for extra toughness when handling abrasive materials. Raincoats, suits, hats, aprons and gloves made of Koroseal are said not to be affected by oils, grease, various acids, alkalies and caustics.

27 **ROLL MILL** — Hardinge Co., Inc., has brought out Bulletin 52, an eight-page catalog describing operation details and applications of the Disc Roll Mill, for grinding relatively soft materials such as limestone, phosphate rock, clays, raw cement mix, etc.

28 **RUBBER LATTICE MOUNTINGS**—Lord Manufacturing Co. has announced Bulletin 701, describing the features and applications of Lord bonded rubber lattice mountings to reduce low frequency, high amplitude vibrations in heavy industrial machinery. The booklet illustrates the mounting in use on a vibrating screen, foundry shakeout and heavy motor-generator. A list of additional uses is included, as well as a reference table giving dimensions and capacities.

29 **RUST PREVENTATIVE—REMOVER**—Western Reserve Laboratories has brought out a specification sheet describing the properties and application methods of Manganese-Phospholene No. 7, for rust prevention and removal. A "before" and "after" photograph of a rusted steel is also included.

30 **SKID-SHOVELS** — International Harvester Co. has issued Bulletin CR-403-F, describing and illustrating the Hydro-Spring feature of International Drott Skid-Shovels in sizes ranging from 1 to 3 cu. yd. Typical application photographs are included.

31 **SWING LOADER**—Pettibone Mulliken Corp. has published a 28-page booklet describing its "Speed Swing," a 180-deg. loader, which may also be used as a regular front end loader with a 5000-lb. capacity. Various applications of the loader are described.

32 **TORQUE CONVERTERS FOR SHOVELS**—Twin Disc Clutch Co. describes "how torque converters on shovels increase efficiency" in a recent issue of "Production Road" magazine. Performance advantages are given, as well as data on efficient power transmission for powered equipment.

33 **TRUCK OPERATING COSTS**—The White Motor Co. has issued a revised "Cost Record Book," providing a comprehensive yet simplified system of analyzing truck operating costs. The system may be adapted to any truck-using business and any size fleet, either delivery service, highway operation, or off-the-road fleets.

34 **TWO-WAY RADIO TELEPHONES**—The Hallicrafters Co. has released Form S-705M, describing and illustrating portable and central station Littlefone two-way radio telephones. Frequency, range, power supply, and optional items are discussed, and dimensions are listed for the various models.

35 **V-BELT MAINTENANCE** — The B. F. Goodrich Co., Industrial Products Div., has brought out a 14-page illustrated manual on the care and maintenance of industrial V-belts. The following topics are covered: drive design; double matching; belt installation; how V-belts grip; importance of tension; drive alignment; how to clean; and storage. Also included are a V-belt service chart, listing typical causes of belt failure, and full-scale photographs showing what belts look like after failure.

36 **WELDER—EMERGENCY POWER UNIT**—The Lincoln Electric Co. has prepared a bulletin describing and illustrating the "Weldanpower," combination 200 amp. welder and 4 kv.a. standby a-c power unit for welding and emergency power. Typical applications are given, as well as installation details, output ratings and specifications.

37 **WIRE ROPE AND CHAIN FITTINGS**—American Hoist & Derrick Co. has announced a 28-page catalog, No. 950-1, describing and illustrating a complete line of fittings for wire rope and chain. Engineering data and charts, dimensions, safety factors and parts illustrations are included.

38 **WIRE ROPE BLOCKS AND FITTINGS**—Sauerman Bros., Inc. has issued Bulletin 163, showing features of the Durolite blocks in sizes from 6- to 42-in. A rigger's block with an extra wide sheave groove, permitting use of larger cable, is also described. Also released is Bulletin 164, containing tables, drawings and ordering information for open and double wedge sockets in rope sizes from ⅜- to 2-in.

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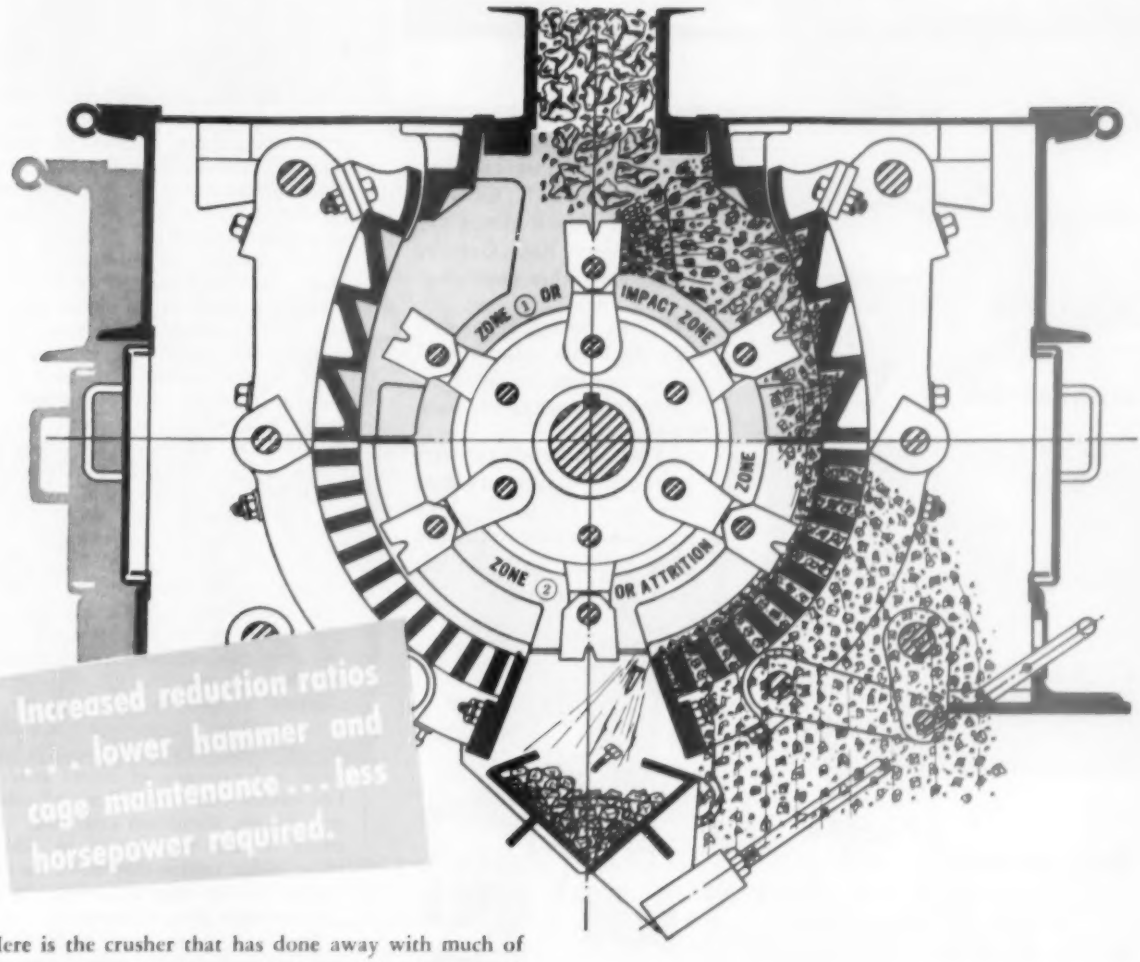
The PENNSYLVANIA REVERSIBLE HAMMERMILL



Increased reduction ratios . . . lower hammer and cage maintenance . . . less horsepower required.

Here is the crusher that has done away with much of the wear on screen bars and hammers that is expected in hammermills of conventional design. Examine the illustration above. Note that most of the size reduction takes place in the upper or impact zone by free air impact, without any attrition action. Only when particle size is greatly reduced does material being crushed reach the attrition zone where hammers force feed through the cage bars to give a uniform sized product. Thus attrition and wear is held to a minimum. Then too, the reversible feature doubles hammer life and eliminates down time and labor cost of turning hammers. Ask for Bulletin No. 1034 that gives complete details.

PENNSYLVANIA CRUSHER DIVISION

Bath Iron Works Corporation • West Chester, Pa.

PENNSYLVANIA

Thousands of crusher installations plus 50 years experience designing and developing size reduction machinery makes our engineering staff an outstanding group to consult with on crushing problems.

PE-208

ROCKY'S NOTES

(Continued from page 35)

dolomite) is used in place of quartz sand, the cement mortar specimens are far less vulnerable to sulphuric acid and sulphate corrosion."

In his closure to the discussion of his paper Dr. Thorvaldson said: "In general, there seems to be overwhelming evidence that the alumina compounds are the vulnerable part of set portland cement exposed to sulphate waters. The only argument stems from the variability, in practice, of concretes made from cements of equal alumina content. Experimental evidence indicates that only a very small amount of C_3A as a separate crystalline phase is necessary to destroy the volume stability of mortars in sulphate solutions. It seems probable that portland cements in the higher ranges of alumina content contain some C_3A as a separate phase, but that as the Al_2O_3 content decreases and the Fe_2O_3 content increases, this probability is greatly reduced due to the solution of the C_3A in the super-cooled glass phase and the formation of ternary compounds of iron and alumina. Considering exposure to Na_2SO_4 and $CaSO_4$, it would seem that vulnerability of the C_3A as a separate crystalline phase is of the first order of magnitude, that of the C_3A dissolved in the glass of the second order, and that of the alumina containing iron phase of the third order. The distribution of alumina between the three forms is determined by the physical conditions during manufacture and possibly the incidental presence of minor oxides, i.e., oxides other than those of calcium, silicon, aluminum and iron. The effect of the compounds in which these minor oxides may occur in the clinker on the sulphate resistance of the cement is still unknown."

The next several pages of the Symposium are devoted to special cements — aluminous cement, slag cements, expansive cements, oil-well cements, masonry cement, with a concluding paper "Development of Cements for Special Uses in the United States" by Myron A. Swayze, Lone Star Cement Corp., U.S.A. In this Mr. Swayze summarized history familiar to American readers on the development of portland cement specifications which have now provided us with five recognized varieties. He also touched on portland-pozzolan cements, which he said were tried and discarded many years ago in California for highway use because of their slow curing and greater shrinkage. However, he added, "The use of pozzolanic materials, either as a portland-pozzolana cement or as a blend of the two materials at

Cut Grinding Costs!

ABK METAL LINERS GIVE BIG SAVINGS

Substantial savings are realized by cement mill operators using ABK Metal liners in primary, secondary or tertiary compartments for wet or dry grinding of raw stone or finished product.

Extended liner life of as high as 3 or 4 times can be expected when ABK Metal replaces ordinary iron liners. That's because of the extreme hardness (500 to 700 Brinell, as required) and very high resistance to abrasion that is characteristic of every ABK Metal casting. A nickel-chrome iron of controlled structure, ABK Metal is produced only by Brake Shoe.

Why let abrasion steal your operating dollars. Specify ABK Metal castings . . . cut your replacement, maintenance and downtime costs and increase your grinding mills' efficiency.

QUALITY CASTINGS IN | **ABK METAL** **ABSCO METAL**

1607

AMERICAN Brake Shoe COMPANY

Baltimore • Chicago • Houston • St. Louis • San Francisco • Superior • Toledo

BRAKE SHOE AND CASTINGS DIVISION
230 Park Avenue, New York 17, N. Y.

the concrete mixer is definitely gaining ground in the field of mass concrete."

An interesting commentary on this paper was made by Dr. R. R. Hattiangadi, Associated Cement Cos., Ltd., India, who said: "A development of special cements on a commercial scale could not, I believe, have been possible in any other country than the United States. May I be permitted to observe that it is the combined result of the American spirit of restlessness and inquiry, as well as a variation of the principle that the customer is always right — as reflected in the latitude given to the consumer to write his own specifications for an engineering commodity like portland cement; a latitude which, in turn, connotes a high degree of competence and understanding on the part of the consumers of what the various shades of difference in the specifications denote."

The various papers on special cements, referred to above, do not appear to us to be of sufficient general interest to our readers to review here. However, the one on slag cement is, because there is every reason to believe from European experience that portland-slag cements are superior to plain portland cement, at least for some purposes. In our country we have advanced far enough along this line to have an A.S.T.M. Tentative Specification, so it is obvious that interest is building up. We shall discuss this subject in a later issue, based on the paper referred to.

CEMENT RESEARCH

(Continued from page 96)

hands a new and powerful tool for the overall control of the process.

It is only in recent years that the techniques of X-ray crystallography, combined with the development of electronic computers, have made this process practicable for the determination of crystal structures. The method is very young in cement research laboratories but already is being explored in several countries.

Our work in this field dates from December, 1948, when Ordway started his studies on the crystal structure of tricalcium aluminate. This was the first study of its kind at the National Bureau of Standards but it has become the nucleus of a rapidly expanding group. The Bureau electronic computer SEAC has been placed at our disposal and Ordway has been instrumental in developing the mechanism for handling the three-dimensional Fourier series required by structural studies.

In basic research of this character, it is not usually possible to predict just wherein the results will be applied to the problems of an industry. In

Less Shifting, Less Maintenance with this

CLARK PACKAGE UNIT

Torque Converter and Transmission Integral

Operating advantages are clear and exceedingly profitable, when you use a Clark Package unit

- **vastly reduced shifting—less fatigue**
- **smooth flow of power regulated to engine's most efficient speed —3-to-1 multiplication factor builds up torque to meet need**
- **reduced shocks: longer life for all gears, shafts and engine**
- **greatly reduced maintenance on entire power-train**

A Clark to meet your need—Clark's broad line (15 to 600 hp—11" to 26" diameters) assures a size and capacity for every power-transmission requirement.

You can do as several leading manufacturers are doing: Take advantage of Clark's unique experience in the basic field of torque transmission—from flywheel to point of use—to get more useful power at less cost. Any problems?—talk to Clark.

Start by sending for the Clark Torque Converter Bulletin—a helpful statement on torque multiplication.

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Please send set of Clark Torque Converter Bulletins.

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journeying into these new regions of science we do not know what will be our prize but we venture with complete conviction that some gems of great value will fall to our pack. All of our past experience supports the justification of that assurance.

Also of very recent date are the electron microscope and the electron diffraction camera. The former has extended the range of visual observation down to about 1/100 of that permitted by the most powerful light microscopes, so that objects as small as 20Å (0.000,000,080 in.) can now be seen. The shape, size and structure can be observed and the resolution is such that the image can be magnified to 100,000 diameters. Furthermore, a procedure known as replica or shadow casting can be introduced by which a shadow of a suitable vaporized metal is projected across the object resulting in an image that has the appearance of being three-dimensional. In this way the height of the object can be measured and positive distinction made, for example, between a sphere and a disk.

The electron diffraction camera is similar to the microscope except that the arrangement of the lenses permits the transmission of the diffraction pattern rather than the reconstructed image. The ease with which electrons are absorbed limits the application of the method to very thin films and surfaces, but its value lies in that very limitation because the penetrating power of X-rays prevents their application to thin films and surfaces.

These two instruments provide the means for delineating and resolving the microstructure of the products of cement hydration not detectable by any other means. During the past few years we have had occasion to note their unique value. Recognizing extensive gaps in our knowledge of the morphology and identity of the various phases of cement hydration, research was undertaken by the Fellowship in cooperation with the Portland Cement Association and the National Bureau of Standards to elucidate the size, shape, structure and nature of the gel particles that make up the colloidal systems of the cement-water paste. Micrographs were obtained by Swerdlow and Heckman of portland cement and specimens of tricalcium silicate specially prepared by Copeland and his associates, which showed the presence of small spherical particles ranging from about 50 to 200 Å in diameter. These particles were recognized by Brunauer as having the right size range for agreement with the deductions of Powers and Brownyard drawn from surface-area data,

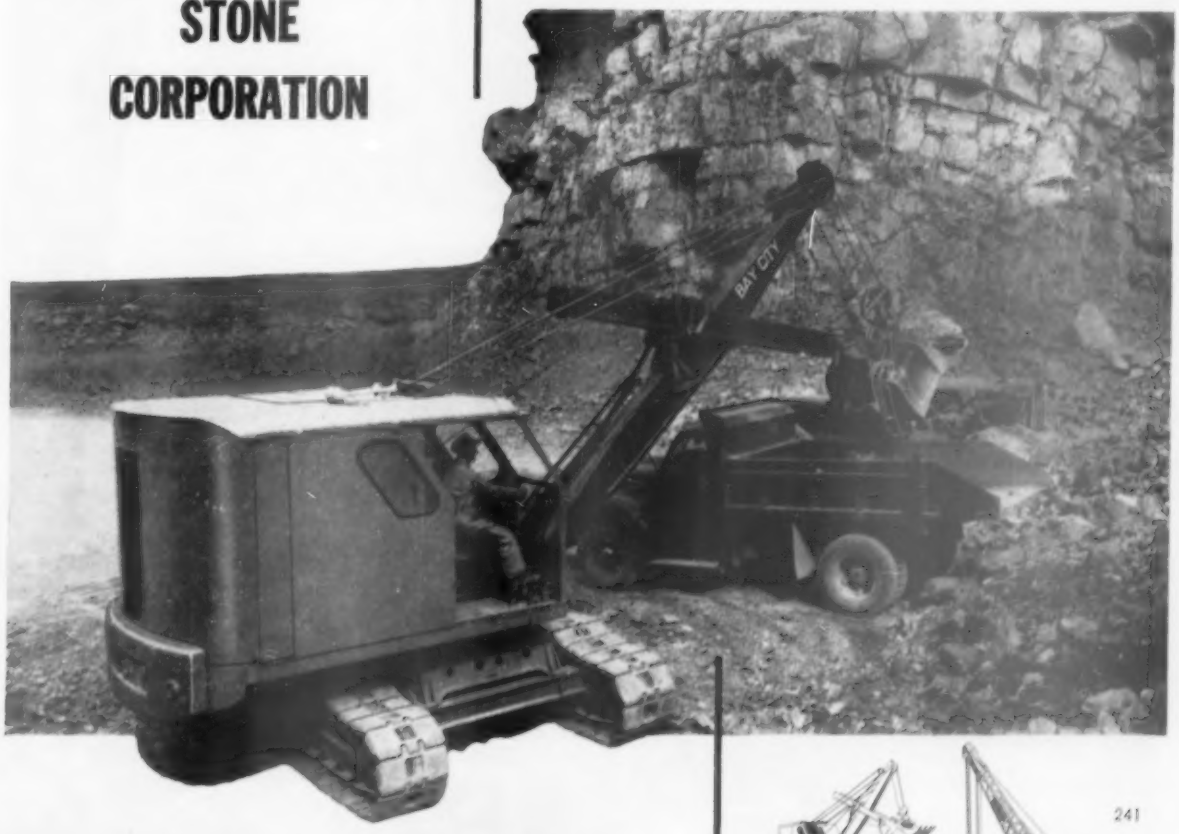
(Continued on page 139)

BAY CITY

¾-YARD SHOVEL handling 800-1000 tons blasted rock per day for the CATSKILL MOUNTAIN STONE CORPORATION

"Our BAY CITY Model 45 shovel with ¾-yard rock type dipper not only averages 800 to 1000 tons of blasted rock per 10-hour day in feeding the crusher, but it also sorts out stones weighing up to 6 tons for secondary blasting," says Mr. W. H. Peckham, President of Catskill Mountain Stone Corporation. BAY CITY doubled the daily production over a former light duty ¾-yard shovel, proving once again that for heavy duty work there's nothing like the tough, powerful BAY CITY. It has double dipper sticks, 3-part line, a 6-foot rotating path, helical cut gears, separate shafts and bearings for each hoist drum, and it is powered by a big 517 cubic inch Waukesha engine. These specifications compare favorably with many 1-yard shovels. Get complete information on the BAY CITY 45 from your BAY CITY dealer.

Write for these catalogs describing BAY CITY *Crawlers of ½ yards and up,* BAY CITY *CraneMobiles and CraneWagons in capacities to 25 tons.*



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BAY CITY SHOVELS, INC. • BAY CITY, MICHIGAN

SHOVELS • CRANES • HOES • DRAGLINES • CLAMSHELLS

200 to 400
TONS PER HOUR!

when it gives
Production like this—

IT'S A CEDARAPIDS COMMANDER

Wherever you see a portable aggregate plant producing 200, 300 or 400 tons per hour, day after day and month after month, with low, low operating costs — chances are it's a Cedarapids Commander!

The plant shown below, owned by P. O. Pederson of North Branch, Minnesota, is turning pit run gravel (with crushing 15% and up) into ¾" and 1" aggregate at a rate of 200 to 300 tons per hour. Other producers report as high as 400 tons per hour production!

The big, *balanced* production of crushers, horizontal screen and conveyors is the secret of the Commander's high tonnage output. Cedarapids-Quality construction is the secret of low maintenance and operating costs.

There's sure to be a Commander working near you. Watch it produce — ask the owner for his opinion — then call your Cedarapids distributor for additional information.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U. S. A.

CEMENT RESEARCH

(Continued from page 136)

and he suggested that they were the ultimate particles of the gel produced by tricalcium silicate.

Thus, by investigations with X-ray crystal structure and with electron optics we are entering a field that hitherto has been impenetrable to the tools of research. Recently also has been added the further tool of differential thermal analysis, by which the changes in energy level of cement-water systems with change in temperature can be measured directly. With these new tools we believe that a new era of cement research is being inaugurated and, with it, a new era in the production and utilization of portland cement.

Cement Prices Increased

CEMENT PRICE INCREASES have been announced for the first quarter of 1956, by many leading cement producers. The increases were necessitated by "rising costs in power, fuel, labor and spare parts," and a "general inflationary spiral."

Lehigh Portland Cement Co., Allentown, Penn., increased prices 15 cents a bbl. at 10 plants: Fordwick, Va.; Union Bridge, Md.; Alsen, N. Y.; Sandt's Eddy, Penn.; Ormrod, Penn.; Fogelsville, Penn.; Mitchell, Ind.; Ogelsby, Ill.; Mason City, Iowa; and Iola, Kan. Prices at the Birmingham, Ala., plant were increased 25 cents per bbl. Prices at Buffalo, N. Y., and Bunnell, Fla., were not increased, as prices there were raised 25 cents a bbl. for the fourth quarter of 1955. No decision has yet been reached on the Metaline Falls, Wash., plant.

Ideal Cement Co., Denver, Colo., increased cement prices 15 cents per bbl., at; Ada, Okla.; Baton Rouge and New Orleans, La.; Mobile, Ala.; Houston, Texas; Okay, Ark.; Superior, Neb.; Portland and Boettcher, Colo.; Devils' Slide, Utah; Trident, Mont.; and Spokane, Wash. The increases do not apply at Redwood City and San Juan Batista, Calif., and Gold Hill, Ore., as earlier announced price increases for these locations will take effect April 1, 1956.

Penn - Dixie Cement Corp., New York, N. Y., has raised prices 15 cents per bbl. at six of its plants: Nazareth, Penn.; Bath, Penn.; West Des Moines, Iowa; Kingsport, Tenn.; Richard City, Tenn.; and Clinchfield, Ga. At West Winfield, Penn., the price was increased 20 cents a bbl. Prices at Buffalo, N. Y., will not be raised at this time as a 25 cent per bbl. increase was effected October, 1955. A price announcement

(Continued on page 140)

has not yet been made on its Petoskey, Mich., plant.

Medusa Portland Cement Co., Cleveland, Ohio, increased cement prices 25 and 15 cents per bbl. at Dixon, Ill., and Toledo, Ohio, respectively. Prices at Manitowoc, Wis., were raised 20 cents a bbl., and at its Milwaukee distribution plant by 15 cents per bbl. in November, 1955. Increases at other locations will be raised, but these have not yet been determined.

Universal Atlas Cement Co., New York, N. Y., has announced a 15-cent per bbl. increase at Northampton, Penn., Hudson, N. Y., and Independence, Kan. Its first-quarter price increases at seven other plants and three packing plants amounted to 25 cents per bbl.

Alpha Portland Cement Co., Easton, Penn., increased cement prices 15 cents a bbl. at Cementon, N. Y., Martin's Creek, Penn., and Mannheim, W. Va. No change will be made at Jamesville, N. Y., and prices at four other plants will increase 25 cents per bbl.

Marquette Cement Manufacturing Co., Chicago, Ill., raised prices approximately 25 cents per bbl. late in 1955 at six plants, and has made no plans to increase prices at its Cape Girardeau, Mo., and Cowan, Tenn., cement plants.

Lone Star Cement Co., New York, N. Y., has increased prices 15 cents per bbl. at its Nazareth, Penn., and Hudson, N. Y., plants. Bessemer Limestone & Cement Co., Youngstown, Ohio, has raised prices 6 percent, and Northwestern Portland Cement Co., Seattle, Wash., increased its prices 20 cents per bbl.

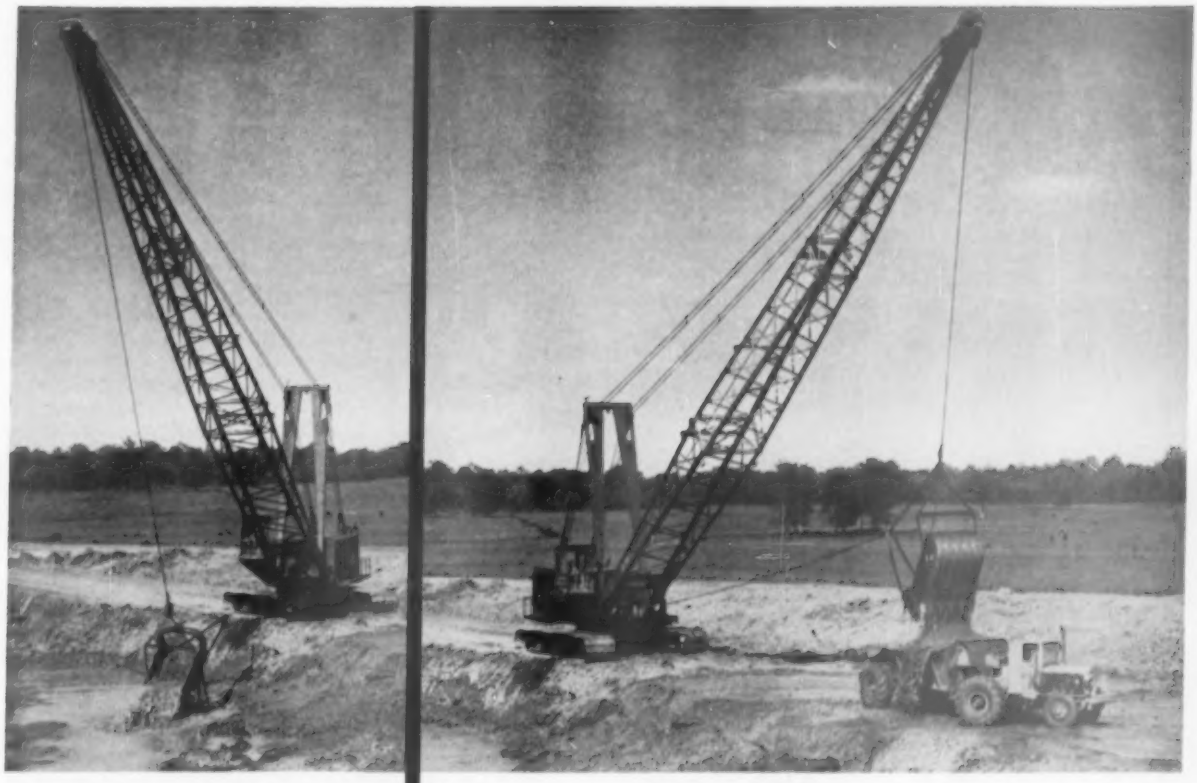
Calaveras Cement Co., San Francisco, Calif., has announced price increases for the second quarter of 1956, averaging about 4 percent. Prices of its gray cement will be raised 15 cents per bbl. at San Andreas and Kentucky House, Calif., effective April 1.

Builds Agstone Plant

J. H. ROCKHOLD AND SONS of Belle Center, Ill., is building an agricultural limestone plant in Champaign County, Ill. The plant will be located on the site of an old limestone quarry east of Urbana, Ill., and is expected to have a daily capacity of 250 tons of agstone.

Canadian Sand and Gravel

CANADIAN SAND AND GRAVEL PRODUCTION increased to 110,961,034 short tons in 1954 from 101,033,949 short tons in 1953, according to bureau of statistics report. The value of sand and gravel rose to $58,987,671 in 1954, compared to $53,485,401 in 1953.



Manitowoc mobility and stability delivers big yardage at Dutch Gap

To keep material moving at a rapid rate into its screening and processing plant, Southern Materials Co., Chester, Va., uses a big capacity Manitowoc 4500 dragline to get the job done fast, at lowest cost. This massive Manitowoc, equipped with a 5-yd. perforated bucket, delivers to loading units an average 12-yds. of sand and gravel from the James River every 3 to 4 minutes. A 120′ boom provides extended reach for full buckets at maximum working range.

MONEY-SAVING MOBILITY

Here's a 5-yarder that's as mobile as a lightweight — with the stability and balance you need under all conditions. Wide, 60″ pads and lowest bearing pressure make traveling easy in soft going. The absence of cumbersome electric trailing cables speeds movement on the job. Thousands of hard-to-maintain electrical wires and components are eliminated by the effective diesel unit drive pioneered by Manitowoc. The entire unit can be shipped by railway cars or highway trailers and assembled in days rather than the weeks required for other machines of comparable capacity.

MAXIMUM OPERATOR CONVENIENCE

Air controlled throughout for all operating clutches and brakes to lessen operator fatigue. Torque converter available to balance power to load for peak performance with or without first-class operator. Elevated pilot house raises operator's eye level to 15′ for full vision over banks and makes for fast, sure spotting when loading.

SEE YOUR MANITOWOC DISTRIBUTOR

Want a big capacity machine with all the finest features in your pit? Then get all the facts on the Manitowoc 4500. MANITOWOC ENGINEERING CORP., MANITOWOC, WIS.

MANITOWOC

SHOVELS 1-5½ YD. Speedcrane CRANES 20-100 TON

A.C.I. Annual Meeting

THE AMERICAN CONCRETE INSTITUTE will hold its 52nd annual convention February 20-23, 1956, at the Bellevue Stratford Hotel, Philadelphia, Penn. The first day of the convention will be devoted to registration and technical committee meetings. Lewis H. Tuthill, of Committee 604, will speak on "Proposed Recommended Practice for Winter Concreting" at the general session, February 21st. "Erosion Resistance of Concrete in Hydraulic Structures," will be discussed by Walter H. Price, Committee 210, and William A. Cordon, Committee 214, will speak on the "Evaluation of Compression Test Results." A panel discussion on building code revisions will be conducted by vice-president, Frank Kerekes, chairman, Committee 318, Standard Building Code. Motion pictures will also be shown.

February 22, concurrent sessions will be held on "Shrinkage of Concrete" and "Prestressed Concrete," during the morning. An awards luncheon will be held that afternoon, and concurrent sessions will be held on "Construction" and "Design."

The 18th annual open meeting of Committee 115 will be held on February 23, and a panel discussion in the afternoon will be moderated by Dr. A. Allan Bates, Portland Cement Association. Current concrete problems will be discussed by a panel of experts with audience participation.

Grindability of Cement Clinker and Limestone

By F. O. ANDEREGG

TWO DOCTORS' DISERTATIONS have been published by the *Verein Deutscher Zementwerke* in Düsseldorf.

Using a modified Hardgrove method (A. S. T. M. Designation C204-46T) and measuring the surface produced by an air permeability method, A. Schmid and H. G. Zeisel have found that fine grinding follows neither the Rittinger nor Kicks law but is exponential.

For clinkers and limestone, the ease of grinding is inversely proportional to the resistance to abrasion. In limestone it is reduced by insoluble SiO_2, but increased by Al_2O_3 and TiO_2. In clinkers, the presence of free lime helps grinding but MgO and C_2S hinders it.

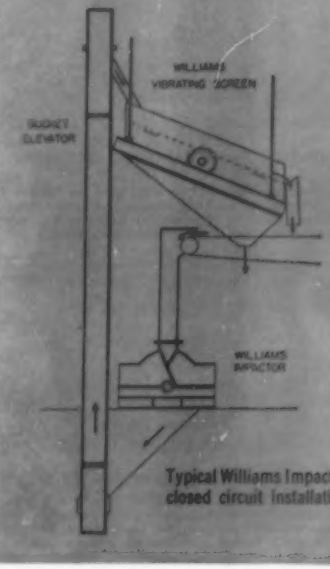
Sand, Gravel Plant

THE WHITE RIVER SAND AND GRAVEL PLANT has begun operations south of Monte Ne, Ark., with a production of 150 to 200 tons of sand and gravel daily. Bill Boyd is owner and operator of the plant, which supplies local contractors.

Lowest-Cost Crushing

with better product control

Open view showing hammers and impact blocks. Extremely rugged, heavy construction of steel plate with manganese steel liners, hammers and impact blocks. Extra large shafts are mounted in oversize bearings sealed in self-aligning housings.



Typical Williams Impactor closed circuit installation

WILLIAMS *Reversible* IMPACTOR

By properly controlling the forces of speed and mass in size reduction operations, Williams Impactors offer the lowest possible cost-per-ton in producing top quality materials from 2" down to 35 mesh with a minimum of fines . . . or much smaller where more friable products are handled. In closed circuit systems with external vibrating screens, a single Impactor promises 100% product sizing with surprising economy, even with the most difficult specifications.

No grates are required, hence no replacement expense of these parts is necessary. Quick, uniform reduction, sizing and discharge from the mill eliminates any grinding attrition action that causes excessive wear, especially if raw materials are highly abrasive. Reversible rotation eliminates manual turning of hammers and minimizes down time. Impact blocks are also reversible which further reduces cost. Parts last up to 7 times longer than in other types of equipment. Unusually low maintenance is a feature of the Impactor.

You have much to gain in lower costs and better product quality control with an Impactor. *Write for literature.*

WILLIAMS PATENT CRUSHER & PULVERIZER CO.

800 St. Louis Ave. **St. Louis 6, Mo.**

WILLIAMS

CRUSHERS GRINDERS SHREDDERS

Hammer Mills Helix-Seal Mills Roller Mills Air Separators Vibrating Screens Feeders

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

. . . all shaken up over screening problems?

Downtime, high maintenance costs, bearing troubles, supporting structure vibration, whipping and excessive cloth wear . . . do *these* have you shaken up more than the materials you screen?

There's really no need for it . . . these problems won't exist for *you* when you depend upon Deister Screens for high efficiency and low cost screening. You'll appreciate Deister dependability . . . hour after hour and day after day without downtime . . . meeting toughest specifications and keenest competition effectively—with highest profit.

Remember, Deister's exclusive Opposed Elliptical Throw, Unitized Life-Time Vibrating Mechanism, and Adjustable Screen Panels at feed and discharge end, were designed and developed by Deister sizing and separating experts . . . men who specialize in giving the industry exactly what it wants and needs.

There are Deister models and sizes to meet every screening requirement. Write Deister today for their data sheet . . . with complete information on your particular screening problem, Deister engineers can recommend a screen to handle your job better.

DEISTER

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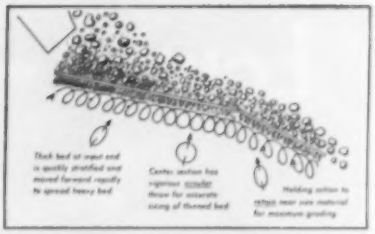
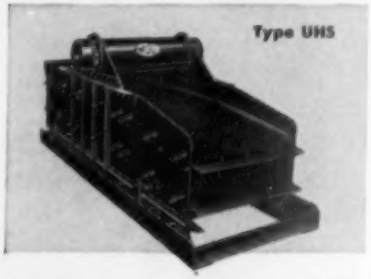
1933 East Wayne Street, Fort Wayne 4, Ind.

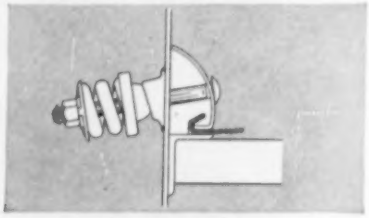


OPPOSED ELLIPTICAL THROW

Deister's exclusive powerful throw action provides more capacity per square foot. Movement of material on the screen is controlled accurately, for the greatest speed and efficiency in sizing.

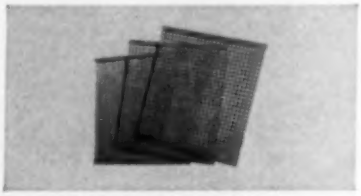


Side tension screen featuring adjustable slope panels. Divided screening sections, identical in size, permit shifting to distribute wear. 1, 2 or 3 decks in sizes up to 6' x 16'.



POSITIVE SCREEN CLOTH TENSIONING

Powerful tension springs hold screen cloth (either with hook strips of clamping angles) in tension over series of cross members arranged in arc. Positive tension, plus curvature, prevents whipping.



DIVIDED INTERCHANGEABLE SCREENING SECTIONS **(On the Type UHS)**

Sections are identical in size; may be readily interchanged or shifted, to distribute normal wear and prolong life of screening medium. Any screen may be changed without disturbing others.

UNITIZED LIFE-TIME VIBRATING MECHANISM

Entire mechanism is precision-constructed, jig-assembled unit—demountable and readily interchangeable—and mounted well above heat, grit and dirt. Renewable sleeves prevent wear on bearing housings and shafts. Oil-bath operation.

SLAG PRODUCTS

(Continued from page 121)

slag sand can then be produced, even with the most rapid cooling. It is much more difficult to convert a highly basic slag melt into the vitreous condition than a more acid slag, because with basic slags, the crystallization sets in at higher temperatures. A vitreous slag is less probably produced if the dispersion of the slag stream with the granulation is not fine enough and accordingly no powerful cooling can occur.

This can occur with very hot slag, for example, with the simple granulation spout and bottom water if the spout is too short or the water amount is too small. With the granulation drum, apparently as a result of insufficient disintegration or as a result of too small amounts of water, the abrupt quenching of the slag is not so strong as with the wet granulation process or with the Opderbeck granulation mill. On the basis of technical experience, the hydraulic characteristics of the slag sand are thus only to be influenced by the velocity of the cooling.

The most extensive cooling effect is, without doubt, present with the wet granulation process, but this advantage, however, is generally achieved at too high a cost. Large amounts of water are needed for the process and plant, and much attention is required for the cleaning and handling of the waste waters. In addition, the granulated slag sands obtained by this process contain large amounts of water, which can range between 15 and 50 percent according to the temperature and slag composition.

In the cement industry, water content plays a great role. It raises the production costs not only by virtue of the heat consumption needed for the drying, but in addition, it can raise freight charges considerably, if these intervene.

In Fig. 5 is shown a survey of the heat consumption and associated costs with the use of blast furnace gas or coal as the heat source, and the drying of slag sands with various water contents. The actual drying costs rise with rising water content, almost in a straight line. The prices given correspond to 1953 conditions.

Many iron and steel works, which do not operate their own cement mills, would be glad to dispose of slag sands, for commercially more favorable operating conditions. This most certainly would be the case, if one could deliver a dry slag sand to the cement industry. Also in cases of water scarcity, every opportunity should be sought to reduce the water consump-

(Continued on page 148)

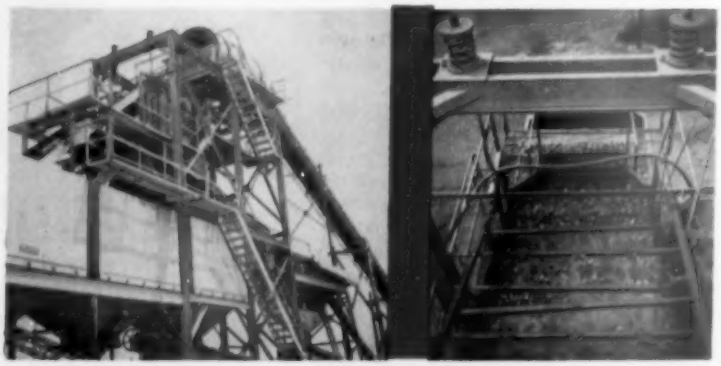
3,000 TONS OF

handled by a SIMPLICITY grizzly feeder at Badger Materials in Indiana

On the Indiana Turnpike, Badger Materials Co. is using a Simplicity Grizzly Feeder to handle 3,000 tons of aggregate a day, some of it well over 16 inches in diameter. This same material is being accurately sized by a Simplicity Simpli-Flo two bearing screen. A smooth operation throughout.

Start of the operation is shown here as a seven-yard truck dumps aggregate into a 25-yard receiving hopper. Feeding from this hopper is a Simplicity 3′ x 10′ OA-10-A2 Grizzly Feeder. The stone is fed off the grizzly bars and into a large gyratory crusher. The undersized material passes easily through the bars and onto a belt running under the crusher (the belt also receives crushed stone from the crusher). From here the material is fed into a plant which acts as a secondary crusher.

The material then travels up another belt, goes through a washer, and is discharged . . . onto a Simplicity 4′ x 12″ Simpli-Flo, 3-deck screen. Further washing is accomplished by spray bars on the Simpli-Flo, which is suspended by overhead springs and cables. The various sizes of material are dropped into hoppers and hauled away by trucks. Sand and undersized are sluiced off for separation.



171

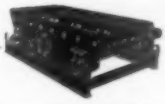
AGGREGATE A DAY

Simplicity Simpli-Flo Screens are two-bearing screens, generally hung by springs and cables from overhead supports. Simpli-Flo screens omit the usual main frame and outboard bearings, thereby offering minimum width for installations where width is a problem. On these double-end drive screens, the eccentric shaft is counter-balanced for efficient true circle operation; bearings are heavy duty eccentric type, protected against dust and water by labyrinth seals; discharge lips are readily accessible; and screen cloth is arranged for easy changing.

The Simplicity Grizzly Feeder combines scalping and feeding in one operation. This unit eliminates the old type arrangement of apron feeder and stationary grizzly. You will gain additional plant room. Your operating and maintenance costs will be cut by 50%. Simplicity Grizzly Feeders use an inertia type drive mechanism, and can produce heavy action, allowing sizes up to 6′ x 20′ and capacities up to 1,000 tons per hour. They maintain positive and controlled feed rates under the bin . . . bridging of material in the hopper is eliminated.

OTHER SIMPLICITY PRODUCTS INCLUDE:

- Os-A-Veyor Feeders
- Simplicity Gyrating Horizontal Screens
- Simplicity 32 Series Balanced Conventional Pan Type Vibrating Conveyors
- Simplicity Woven Wire Screens . . . Send for Catalog No. 66



SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.

FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario

FOR EXPORT: Brown and Sites, 50 Church St., New York 7, N. Y.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 13, MICHIGAN

SLAG PRODUCTS

(Continued from page 145)

tion for the granulation process, particularly as only sufficient water is needed to drop the temperature of the fluid slag in the shortest time down to 600 deg. C. Heating tests have shown that at 600 deg. C., the slag undergoes no further change as regards the vitreous condition. A Thomas raw iron slag sand, which had been granulated with the Opderbeck mill, and had a bright gray, brilliant color with about 3 to 5 percent crystalline constituents, was heated to 600, 700, 800, 1000 and 1100 deg. C. and held for 2 hr. at each of these temperatures. The heating at 600 and 700 deg. C. had no influence on the percentage content of the crystallized constituents; merely the color of the slag sand changed to a light brown. The sand is scattered with black grains and the grains begin to cloud at 700 deg. C. The devitrification starts at 800 deg. C. The color changes to gray, and the sand becomes further impregnated with black grains. A part of the sand assumes a dull appearance and the devitrified, perfectly opaque constituents have risen to 20 percent. At 900 deg. C. the grains have slightly sintered together and have completely lost their glance. The color is gray as at 800 deg. C. and a part of the grain is black. The portion of the devitrified content has risen to 75 percent. The grains which can still be regarded as vitreous are colored dark-brown throughout but are still translucent. At 1000 deg. C. the color changes from gray to a greenish-gray and the black grains have completely disappeared. The devitrified constituents amount to 85 to 90 percent, and they appear under the microscope as completely crystalline, while the vitreous portions, while completely black are still translucent. At 1100 deg. C. the color is somewhat brighter and is uniform in color tone. The sand is almost completely crystalline with 97 percent devitrified portion.

Production of Dry Slag Sands

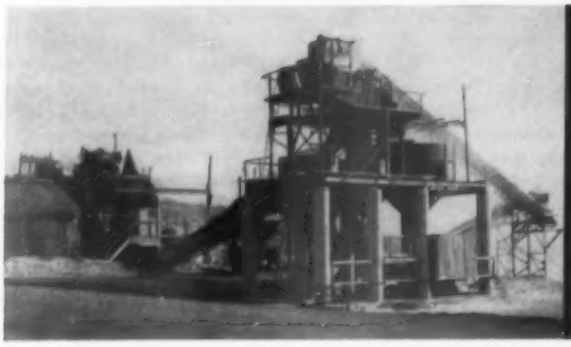
To produce dry slag sands, the use of the granulation drum with the Opderbeck granulation mill is one approach. The moisture content of a slag sand of Thomas raw iron slag produced in the Opderbeck granulation mill is reproduced in Fig. 6 on a frequency basis. The average moisture is located at 5 percent. In trying to save water, consideration must naturally be given to the formation of sulfuretted hydrogen. The solubility of hydrogen sulfide in water is considerable only if low temperatures are present. As shown by J. Stoecker (Stahl

(Continued on page 150)

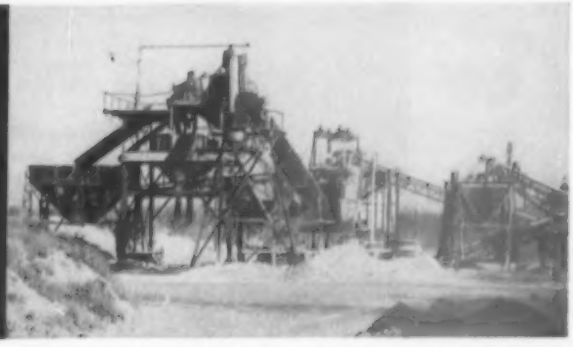
"to keep grizzly materials moving, we had to have three men pushing and shoving,"

reports Mr. Ray Holman, Quarry Superintendent, Quartzite Stone Company, Inc. of Lincoln, Kansas.

"JEFFREY grizzly feeders increased production at each plant 30 tons per hour... a 30% increase"



The Lincoln Plant installed a 5' x 10' long Jeffrey grizzly feeder in September, 1949.



Quartzite Company's Wolf Creek Plant added a similar Jeffrey grizzly feeder in May, 1952.

Grizzly materials are often difficult to keep moving here, especially when they're wet. Even with three men on these bar screens, rock didn't get to the crushers as fast as these plants could handle it.

Addition of Jeffrey electric vibrating feeders eliminated the need for the three men at the grizzlies and permitted later operations to work at capacity. Mr. Holman estimates that each plant was able to boost production by 30 tons—to 125 tons per hour.

Regarding maintenance on this Jeffrey equipment, he says, "Nothing beyond renewing the grizzly bars occasionally."

THE JEFFREY MANUFACTURING COMPANY • Columbus 16, Ohio

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

SLAG PRODUCTS

(Continued from page 148)

und Eisen, Vol. 44, pp. 1129-1132), the solubility is considerably lower above 43 deg. C.

Study also has been made of the influence of the water temperature on the slag granulation process. A change-over was made with an Opderbeck mill from river water to plant water supply. The latter when introduced to the granulation process had a temperature of about 37 deg. C. On 20 subsequent days after the change-over of the waters, samples were taken from the slag sand and investigated to determine the devitrified fraction. The mill was then changed back to river water with a temperature not more than 10 deg. C. and similarly for 21 consecutive days, samples of the slag sand were withdrawn, under the same operating conditions. The results of this investigation are shown in Fig. 7. It can be quite clearly seen that the fraction of the devitrified grains is a more unfavorable figure with granulation using the warm water than granulation with the river water which is nearly 30 deg. lower.

The cause of this can be seen in the fact that the warm water is more prone to evaporate, the slag particles become enveloped with a coating of steam and consequently rapid cooling is impeded. The volume/weight of the slag sand stands in relation to the moisture content. According to C. Weise, the water content decreases with increasing liter/weight ratio — see Fig. 8. Some values of wet granulated slag sand are indicated in the diagram and against this a series of values of Thomas slags, which have been granulated in the Opderbeck mill. A relation between the moisture content and the liter/weight is also indicated here. The average values for the wet granulated sand cannot be inserted directly in the curve by Weise. This is a proof of the fact that the various granulation processes cannot be compared with one another, absolutely directly. A comparison can accordingly only be drawn if the same slag has been granulated under the same conditions by the various processes.

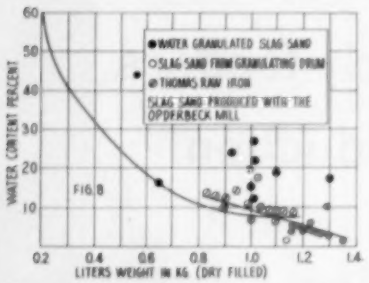


Fig. 8: Relation between water content and liter weight of water granulated slag (C. Weise)

Finally, mention can be made of methods for handling the slag sand after the granulation. In the above, use of a bucket elevator was discussed. However, mechanical handling by means of a hydraulic pump also has attractive possibilities. Thus, at the German Voelklingen steel works in 1934, a new idea was developed for hydraulic slag sand handling and the first large scale tests were made in 1938 on one of the blast furnaces. All of the slag from this blast furnace, after granulation, was fed into a pump without any further addition of water and for a month was pumped up to a height of 20 ft. The test was made with a slurry pump, which had inlet and outlets of 150 mm. internal diameter. Because of wear conditions, the hydraulic slag sand handling method could only be put into operation for three blast furnaces in 1942. Formerly 42 workers were employed in the

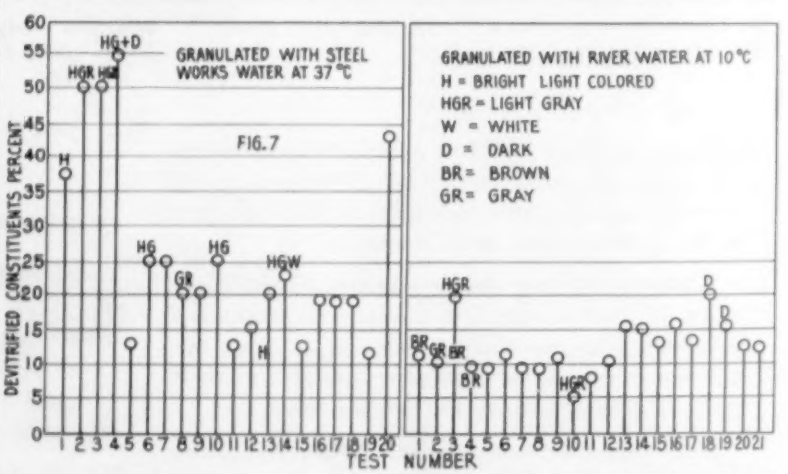


Fig. 7: Devitrified portion of Thomas raw iron slag granulated in the Opderbeck mill showing effect of water temperature

OREGON PRODUCER MEETS STATE SPECS. WITH SECO

Photographed on-the-job near Salem, Oregon

Roy L. Houck & Sons Report Smooth SECO Screens 250 T.P.H. of –2½" Stone

Note in the photograph above a portion of the modern rock crushing plant owned by Roy L. Houck & Sons of Salem, Oregon.

If you were to drive eight miles south of Salem on Highway 99 you could see this model plant. If you live in Oregon, you may be traveling over roads whose fill came from this plant which produces 250 T.P.H. 2½" minus stone for the Oregon State Highway Department.

What do the operators have to say about the workhorse 5' x 14' triple-deck Seco Vibrating Screen which is an integral part of this plant? "Extremely smooth running with very little vibration transmitted to the supporting structure" to quote Roy L. Houck and Sons. What does this mean to you? It means the key to better screening. Seco smooth performance is engineered right into the screen, not only for high tonnages, but for accurate sizing and long, long life.

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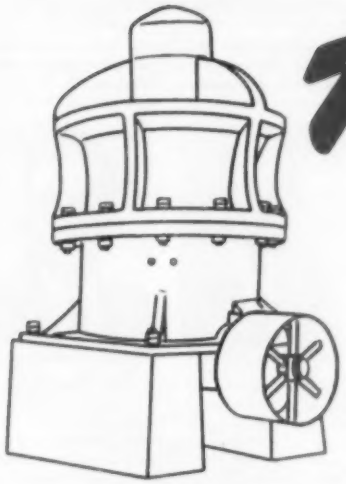
Buffalo 25, N. Y.

cableway handling plant. After putting the hydraulic handling system into operation, only 14 men were required. Since placing into operation, considerable experience has since been gained with the installation so that it now is planned to install two hydraulic pumps on each blast furnace, by which heavy and light slags can be handled separately in various granulating basins. As the first step, hydraulic slag sand handling pumps have been installed on four of the blast furnaces.

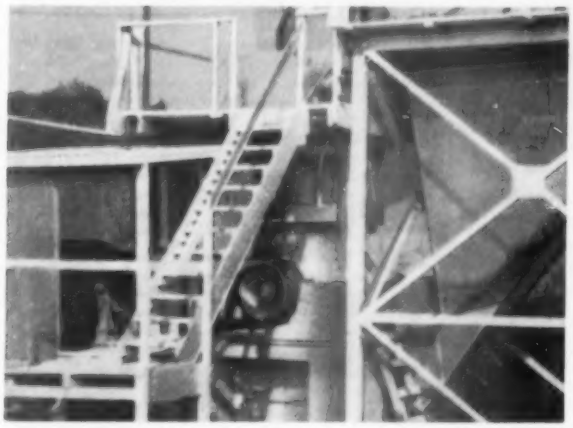
The chief points of interest with this granulating installation consist of the pump itself and the granulating hydraulic handling pipeline main. At the present time, a hydraulic pipeline main for mechanical handling of the slag sand from five blast furnaces is in operation, which has an internal width of 400 mm. and a wall thickness of 35 mm. and is constructed of hard cast iron with 450 kg. Brinell hardness. The previous pipeline main for hydraulic handling was constructed of cast iron of 300 to 350 kg. Brinell hardness and had a service life of 2¾ years. It can be reckoned that the pipeline handling main now in operation will attain a considerably higher useful service life. A test piece of non-metallic pipeline construction has been in continuous operation for two years and up to now, has not shown the slightest wear. The wear problem of the hydraulic handling pipeline main itself may therefore be regarded as solved.

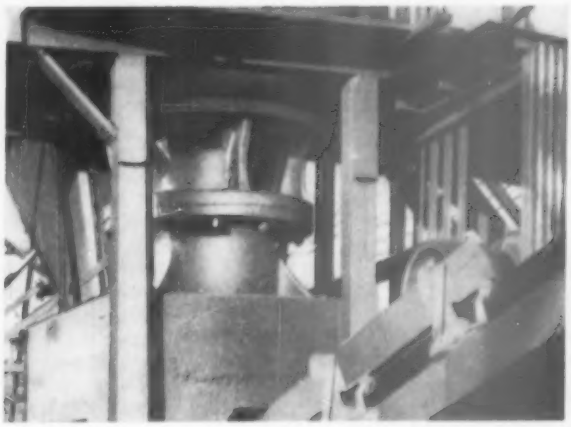
It should be mentioned that this non-metallic pipeline has a considerably lower installation cost than that of the hard cast iron hydraulic handling pipelines which previously have been used. The hydraulic handling pump itself is clad with an armored coating for protection against wear, which has attained a service life of about three months. The rotor of the pump, constructed of the same material as the armor coating, attains a service life of four to six weeks. The price for a rotor amounts to 195 Ger-



Traylor TY GYRATORY CRUSHERS

Lead the way to Increased Profits By Lowering Your Production Costs





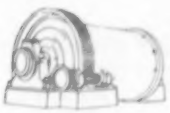
For over half a century Traylor has been designing and custom building machinery to help stone producers get more efficient production. Traylor TY Gyratory Crushers incorporate many exclusive design features developed by Traylor as a direct result of this long-standing, intimate knowledge of hard rock mining problems.

Traylor Original Curved Concaves and Bell Head feature more efficient application of power as a direct crushing force. As a result, lifting and churning of material in the crushing chamber is greatly reduced to keep waste fines to a minimum . . . to produce greater quantities of a uniform, cubical product on the initial pass through the crusher. Traylor curved crushing surfaces also reduce choking and packing because each succeeding zone in the crushing chamber is of greater capacity than the one before it. This results in much greater production at an amazingly low cost per ton produced.

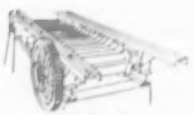
Primary Gyratory Crushers

Rotary Kilns

Ball Mills



Jaw Crushers



Apron Feeders

Send for copy of Traylor's Free Bulletin # 7112 which outlines complete specifications and all features of Traylor TY Gyratory Crushers.

A Traylor leads to greater profits

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man Marks and for a complete armor coating for the pump to 382 German Marks. The changing of a rotor with armor coating can be done in about 2 hr. This can be accomplished at any time during the intervals when the granulating is not being done at the blast furnaces.

The values given in Fig. 8 for the connection between water content and liter/weight of water-granulated cement slags represents an average relationship which has been drawn from a broad band of individual values at an iron works. These figures serve to show that the normal water-granulated slags cannot be simultaneously low in water content and easily millable as is sometimes required by slag cement producing manufacturers.

Summary

Various processes for the granulation of blast furnace slag have been surveyed and the characteristics of the products are considered. The hydraulic characteristics in particular are measured in the percentage content of the devitrified fraction of the slag and the moisture contents.

Moisture content plays an important role, and it is good practice to reduce the water content of the slag sand and accordingly the water consumption per ton of slag sand produced. If the granulation layout has its own water-circulation system or if outside water is used, then one must pay attention to the temperature of the water on entry into the slag granulation system, as this has an influence on the granulation process. It would appear desirable that further investigation work be conducted in this direction.

(To be continued)

Stock Dividend

MARQUETTE CEMENT MANUFACTURING CO., Chicago, Ill., declared the regular fourth quarterly dividend, amounting to 30 cents per common share (after the recent 2½ for 1 split), to be paid December 15 to all shareowners of record at the close of business on December 5. It will bring common dividends paid out of the company's 1955 earnings to a total of $1.08 for the year, after adjustment for the split in shares.

Canadian Lightweight Plant

AGGREGATES & CONSTRUCTION PRODUCTS LTD., Regina, Saskatchewan, has opened a new $300,000 300-cu. yd. per day lightweight aggregate plant near Regina. Clay is obtained from an 80-acre site along Wascana Creek. The company is financed by Saskatchewan shareholders.

MANUFACTURERS NEWS

Hardinge Co., Inc., York, Penn., announces that H. Sidney Downes has been named eastern district manager, replacing G. F. Metz who has retired. His territory includes the

H. Sidney Downes

Clarence B. Brown, Jr.

western portions of New York and Pennsylvania, all of Ohio and West Virginia and most of Kentucky. Clarence B. Brown, Jr., has been appointed southeastern district manager to succeed J. K. Towers, who also has retired, covering southern New Jersey, eastern Pennsylvania, eastern Maryland, Delaware, Virginia, North and South Carolina, Tennessee, Alabama, Mississippi and most of Louisiana.

Basic Refractories, Inc., Cleveland, Ohio, has announces a reorganization of its sales staff. T. P. Stanton has been named Midwestern district sales manager with headquarters in Gary, Ind. Thomas R. Lally, formerly in the Pittsburgh office, succeeds Mr. Stanton as assistant manager of the eastern sales district; T. D. Pence of the Central sales district moves to the Pittsburgh office; and Charles A. Greenlee transfers from a staff position in Cleveland to a sales assignment in the Central district.

R. F. O'Mara, consulting engineer in industrial fume control and formerly vice-president and sales manager for a leading organization in the dust and suspension-recovery field, is on a four-month, around-the-world trip to study latest advancements in dust and air pollution controls currently being used in 17 major countries.

The Foxboro Co., Foxboro, Mass., has appointed Vincent V. Tivy as chief application engineer. Formerly manager of refinery instrument sales, he will also serve on the engineering executive and sales product committees.

Greer Hydraulics, Inc., Jamaica, N. Y., has appointed Hydro-Air, Inc., St. Louis, Mo., as distributor in Missouri, Nebraska and Kansas, western Iowa and southern Illinois.

Concrete Transport Mixer Co., St. Louis, Mo., has appointed R. A. Young & Son, Fort Smith and Little Rock, Ark., as distributor in all of Arkansas except the extreme northeastern sector which is covered by Memphis Truck Equipment Co., Memphis, Tenn.

The Monarch Rubber Co., Hartville, Ohio, has announced the appointment of Donald L. Roach as western states district manager. He was formerly associated with E. I. du Pont de Nemours & Co.

Peerless Pump Division, Food Machinery & Chemical Corp., Los Angeles, Calif., announces that Robert P. Young has been named manager of the New York district office. Formerly sales engineer in the Pittsburgh office, Mr. Young succeeds F. W. McCann, who has resigned.

The Timken Roller Bearing Co., Canton, Ohio, announces that E. W. Austin, general manager, has retired after 36 years of service. He started as a field representative in 1919 and helped to open the first Detroit office.

American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill., has appointed the following distributors: The In-

Best place to head for is your Caterpillar Dealer.

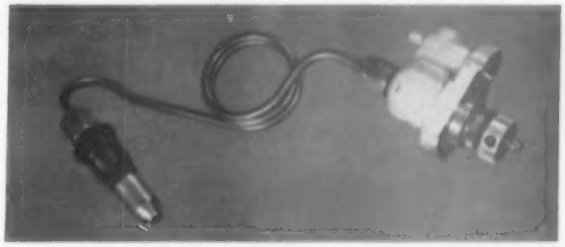
If the trouble's with substitute fuel injection parts, you should know this:

Original Caterpillar fuel pumps and injection valves are made from very special steel — the finest chromium alloy ball-bearing type. They're made with special tools in a special factory—only one of its kind in the world. Each pump is pre-set and given a 6-hour run-in. Single orifice design of valve cuts down possibility of fouling. In short, with Caterpillar parts you're sure of better performance, less down time.

With substitute parts, can you be sure of anything?

Better get Caterpillar original parts every time.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



With clean fuel, CAT® fuel injection valves and pumps can last 20,000 hours and more. They are 100% interchangeable among cylinders of same engine or like models.

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terstate Welding Sales, Marinette, Wis.; Red Ball Supply, Inc., Oklahoma City, Okla.; Spencer's Industrial Sales & Service, Fallon, Nev.; Superior Oxygen Co., Houston, Texas; and a new branch of the Williams Co., Louisville, Ky.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has announced the appointment of George W. Porter as manager of the reinforcing products department at Spokane, Wash. Succeeding him at Seattle is Claude V. Baker who has been appointed reinforcing salesman.

Chrysler Corp., Detroit, Mich., has established a regional office in Houston, Texas, for industrial and marine engines, with D. D. Chene as manager.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces that J. D. Harmison has been appointed manager, parts sales, for the tractor group. He was formerly tractor sales manager, farm equipment division.

Bucyrus-Erie Co., South Milwaukee, Wis., has appointed the Syracuse Supply Co., Syracuse, N. Y., as distributor in central New York from the Pennsylvania border north to the St. Lawrence river and includes counties of Clinton, Franklin, St. Lawrence, Jefferson, Lewis, Herkimer, Oswego, Oneida, Cayuga, Onondaga, Madison, Tompkins, Cortland, Chenango, Otsego, Tioga and Broome.

Granco Steel Products Co., St. Louis, Mo., has moved the St. Louis district sales office to 7530 Forsythe Blvd., Clayton, Mo. Fred B. Kallmayer is sales engineer in charge of the St. Louis district office.

SKF Industries, Inc., Philadelphia, Penn., has announced the appointment of J. H. Sutherland as district manager of the Chicago district office. He was formerly field engineer for the Pittsburgh district office and will be

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SECTION REPAIRS — Can be handled on any tire with Firestone's repair facilities.

FIRESTONE RETREADS — A special cut-resistant tread rubber compound is added. Scientifically controlled pressure is applied to eliminate air pockets and to give maximum adhesion.

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YOU'RE time and money ahead when you let Firestone handle your repair and retreading needs.

You cut your tire maintenance costs because Firestone is equipped to do the job better, quicker and at lower cost.

You save with Firestone Traction Cap retreads or Firestone Full Cap retreads because they stand up longer and keep your downtime at a minimum. Firestone Retreads have the proved Firestone new tire tread design for greater traction, greater driver control, more hours of service.

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TRACTION CAPS OR FULL CAPS AVAILABLE FOR THE FOLLOWING TIRE SIZES

8.25-20	18.00-24
9.00-20	18.00-25
10.00-20	21.00-24
11.00-20	21.00-25
12.00-24	24.00-25
13.00-24	24.00-29
14.00-20	24.00-32
14.00-24	27.00-33
14.00-25	29.5 x 25
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16.00-25	

GROUND GRIP FULL CAP | **ALL NON-SKID FULL CAP** | **ROCK GRIP FULL CAP**

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succeeded by Holton E. Fox who was field engineer in the Boston and Hartford territories. Ralph E. Campbell has been appointed district manager of the Pittsburgh office.

Whiting Corp., Harvey, Ill., filed suit in Kansas recently against Hemco Mfg. Co., Argonia, Kan., charging infringement of two U. S. patents, No. 2718195 and No. 2718197, assigned to Whiting Corp. and relating to the Whiting Trackmobile.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has announced the appointment of Napier B. Caldwell as sales manager for the Boston plant. He was formerly manager of tubular products and cold finished steel bar sales and will be succeeded by Joseph A. Moran, sales representative.

Pioneer Engineering Works, Inc., Minneapolis, Minn., has appointed Finn Machinery Co., Orlando, Fla., as distributor in Florida counties east of and including Gadsden, Liberty and Franklin and north of and including Sarasota, DeSoto, Highlands, Osceola and Brevard.

Dayton Rubber Co., Dayton, Ohio, has named John J. Haber as district manager for the industrial OEM division covering northern Ohio and general Great Lakes region. A. E. Meyer has been appointed sales representative for the division in southern Ohio and Indiana, western Pennsylvania and northern Kentucky.

Clark Equipment Co., Jackson, Mich., has appointed Donald E. Stoops as manager of distributor sales for the transmission division.

Hyster Co., Portland, Ore., announces the promotion of Harold R. Lucas to manager of the merchandise division of the general sales department. He has been administrative assistant in the department for six years.

Simplex Forms System, Inc., Rockford, Ill., has appointed Prime-Best, Inc., Milwaukee, Wis., as distributor in southern and eastern Wisconsin, and E. MacDougall & Associates in Wayne, McComb and Oakland counties in Michigan.

Fairbanks, Morse & Co., Chicago, Ill., has announced the appointment of Henry J. Barbour as manager of advertising and public relations. He succeeds L. A. Harlow who has resigned to join an advertising agency. Mr. Barbour has been associated with the company for 31 years.

Borg-Warner Corp., Chicago, Ill., announces that Joseph M. Gartner has been named administrative assistant to the president. H. Charles Yaeger has been appointed manager of manufacturing at the Pesco products division in Bedford, Ohio.

Cummins Engine Co., Inc., Columbus, Ind., has announced the appointment of Peter Bter, Jr., as regional manager for eastern Canada with headquarters at Toronto. He will serve the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador.

The Industrial Diamond Assn. of America, Inc., has moved its administrative offices from New York to 589-591 Turnpike, Pompton Plains, N. J.

North American Philips Co., Inc., Mount Vernon, N. Y., has opened a new office for the research and control instruments division at 1485 Bayshore Blvd., San Francisco, Calif., with Philip I. Wolf as manager.

Worthington Corp., New York, N. Y., has announced the election of George F. Habach as vice-president in charge of engineering, including research and development. He succeeds Harry A. Feldbush, who has been with the firm for 40 years and will continue as consultant on special engineering problems.

Dorr-Oliver, Inc., Stamford, Conn., has announced the appointment of Carlton W. Crumb

as director of technical data and Charles M. Comstock as advertising manager. Mr. Crumb was formerly sales promotion manager while Mr. Comstock served as assistant sales promotion manager.

Worthington Corp., Harrison, N. J., has appointed Ralph G. Griffin as manager of the Cincinnati district office. He joined the company in 1930 as a student engineer and has recently served as application engineer at the Buffalo district office. He succeeds Earle W. Vinnedge who has been named special representative of the Cincinnati district office.

Bemis Bro. Bag Co., St. Louis, Mo., plans to move its subsidiary, the Flexible Package Co., Chicago, Ill., to a new building near Terre Haute, Ind., which is expected to be completed the early part of 1956. A. D. Hoeppner will be manager.

International Paper Co., New York, N. Y., has announced the promotion of A. Siegel to eastern division sales manager of bags and paper for the southern kraft division. He has been assistant sales manager of the division since 1935.

The Timken Roller Bearing Co., Canton, Ohio, has announced a $12,000,000 expansion and modernization program which will include the purchasing of new equipment, increasing capacities of the steel and tube, rock bit and bearing divisions, and purchase of facilities to produce railroad bearings. Improvements include construction of a warehouse at Bucyrus, Ohio, enlargement of the Cambrinius tube mill and construction of an oxygen plant.

Spray-O-Bond Co., Milwaukee, Wis., has announced the appointment of Clair Taylor as sales representative for the lower peninsula of Michigan and Lucas County in Ohio.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has appointed Herbert K. Kingsbury as manager of product sales, centrifugal pump section, Norwood Works.

Pioneer Engineering Works, Inc., Minneapolis, Minn., subsidiary of Poor & Co., Chicago, Ill., has purchased the Como Ave. plant of Minneapolis-Moline Power Implement Co., Minneapolis, and the adjoining plant of United States Air Conditioning Corp., St. Paul.

Baldwin-Lima-Hamilton Corp., Construction Equipment Division, Lima, Ohio, announces the appointment of Krider Equipment Co., Fargo, N. D., as distributor in North Dakota and counties Clay, Norman and Wilkin in Minnesota.

Link-Belt Speeder Corp., Chicago, Ill., announces the appointment of N. V. Chehak as assistant sales manager at the factory in Cedar Rapids, Iowa. He was formerly district representative in the Pacific Northwest and Canada.

The Yale & Towne Mfg. Co., Philadelphia, Penn., announces that Paul R. Minich, Jr., has been named general sales manager of the materials handling division. Joseph J. Murray has been appointed assistant general sales manager.

Simplex Forms System, Inc., Rockford, Ill., has announced the appointment of John G. Carter as sales manager to succeed G. A. Markuson, who was recently elected president. William P. Rhomberg has been named plant superintendent.

Smith Engineering Works, Milwaukee, Wis., announces the appointment of W. S. Beery as New York district representative to succeed Harry Buckenheu, who has retired. Mr. Berry served for many years as assistant to Mr. Buckenheu.

Kensington Steel Co., Chicago, Ill., has announced the appointment of Leonard T. Harris as assistant sales manager. He was formerly sales and service engineer.

Hauling. The 'Jeep' Truck makes easier work of towing this drill over rough ground for core sampling. The extra traction of its 4-wheel drive carries Truck and load up and down steep grades, through mud, sand and soft earth, in all kinds of weather.

How 4-wheel drive 'Jeep' vehicles help quarry operators save time and money

Mobile power. The extra traction of its 4-wheel drive takes the rugged Universal 'Jeep' with air compressor to out-of-the-way locations. With power take-off, the 'Jeep' also operates mobile welders, generators, drills and winches.

Transportation. The 4-wheel drive 'Jeep' Truck keeps pit and quarry maintenance and service moving smoothly . . . carries men, tools, equipment or repair parts wherever they're needed.

Operators of quarries and sand and gravel pits rely on sturdy 'Jeep' 4-wheel drive vehicles for transportation over the roughest areas—to carry men, tools and supplies up and down rugged inclines—and for supplying mobile power for equipment almost anywhere in the operation.

'Jeep' vehicles travel at highway speeds in conventional 2-wheel drive. But they shift easily into 4-wheel drive for extra traction to travel through mud, sand or gravel . . . up steep inclines . . . or over broken rock.

Owners can tell you that 4-wheel drive 'Jeep' vehicles are solid investments, because of their versatility, long life and low maintenance costs. Let your Willys dealer prove how much a 'Jeep' vehicle can do for you—and save for you—with an on-the-job demonstration. Or write for information.

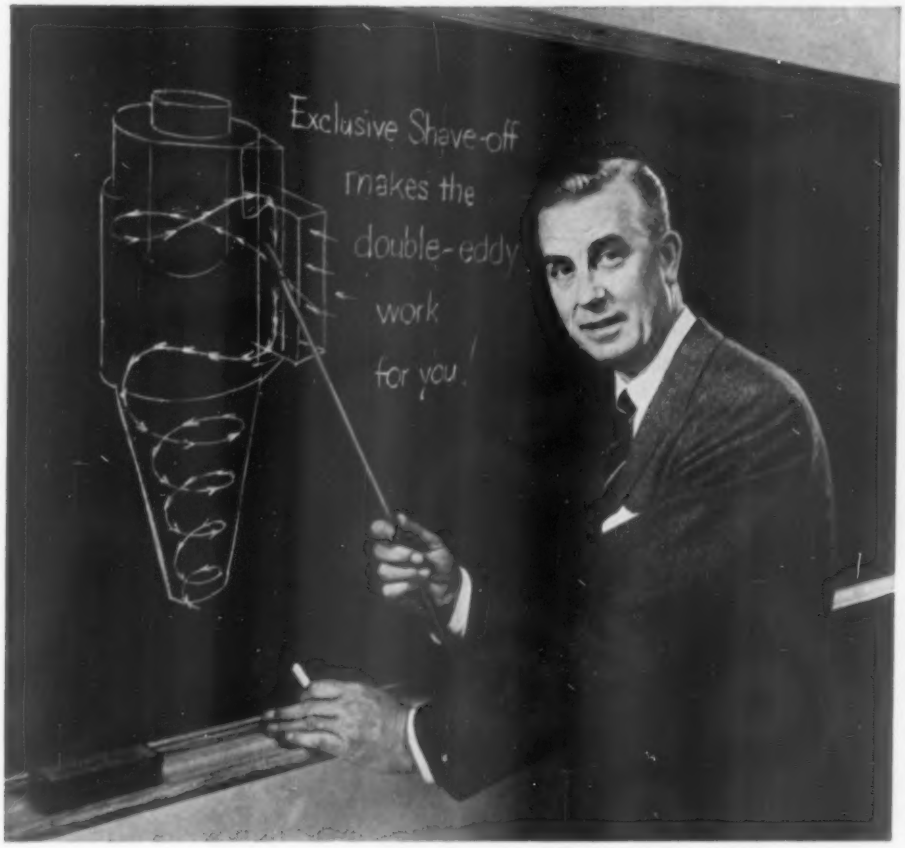
The 'Jeep'®

family of 4-wheel drive vehicles

WILLYS... makers of the world's most useful vehicles

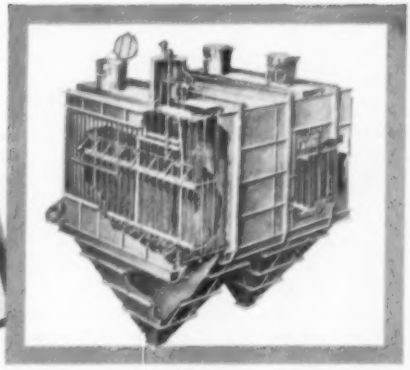
WILLYS MOTORS, INC., TOLEDO 1, OHIO

How Buell delivers the EXTRA PERCENT in Dust Collection Efficiency

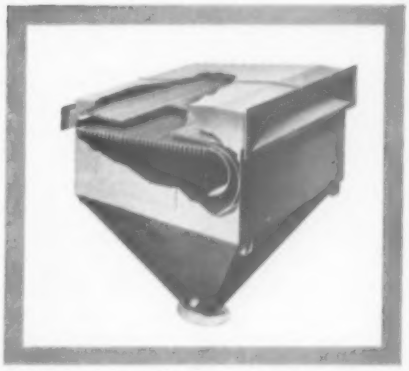


In any cyclone dust collector there is an upward eddy preventing the separation and dropping-out of a percentage of particles. But in Buell Cyclones, the exclusive Buell shave-off design *harnesses* this up-flow—puts it to work! Result: extra efficiency without extra operating cost!

For the complete story behind Buell's *extra efficiency*, write Dept. 17-B Buell Engineering Company, 70 Pine Street, New York 5, N. Y.



Buell's Low Resistance Fly Ash Collector combines top efficiency with low draft loss, for either natural or forced draft installations.

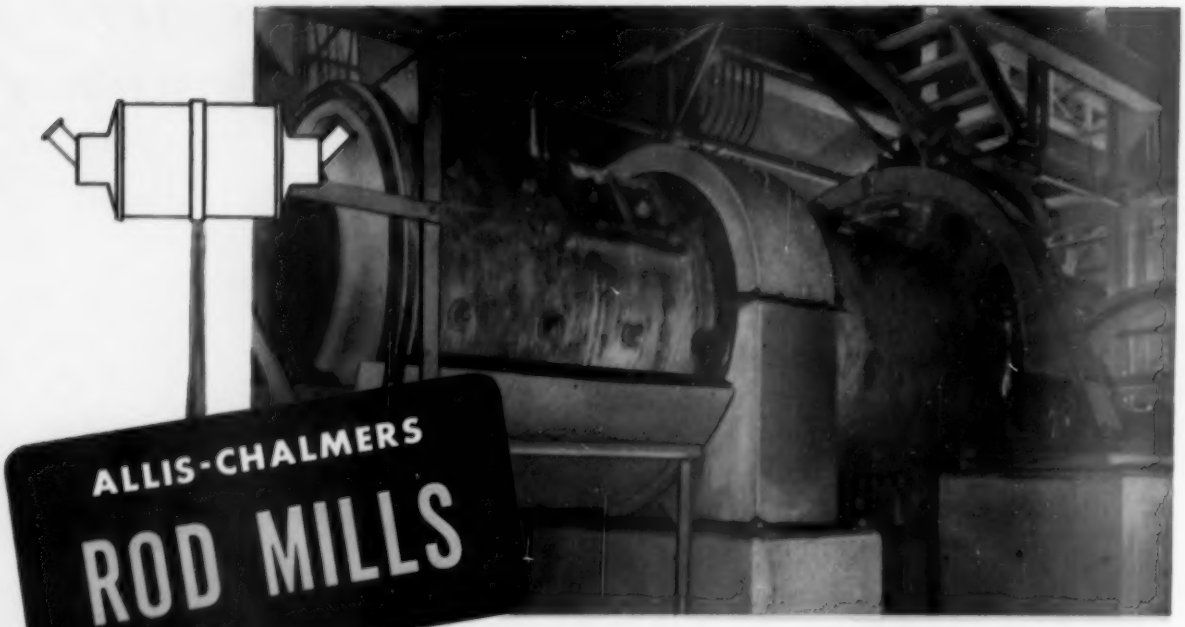


SF Electric Precipitator, a Buell exclusive, also delivers *extra efficiency* due to unique Spiralectrodes and continuous cycle rapping.

buell

MECHANICAL ELECTRICAL

Experts at delivering Extra Efficiency in **DUST COLLECTION SYSTEMS**



for "Manufacturing" Sand

★ **PRODUCES SPECIFICATION SAND**

★ **EXTENDS LIFE OF NATURAL DEPOSITS**

An Allis-Chalmers rod mill converts stock piles of unsalable material into *specification* sand. It prolongs the productivity of natural reserves. It produces specification sand in areas where natural sands are unusable, thus eliminating transportation expense and inconvenience.

Rod Mill Advantages — Processing specification sand from rock, coarse aggregate and natural sand is a particularly abrasive and difficult job. That's why Allis-Chalmers rod mills are so well suited for the job. Basically the A-C rod mill is a simple, rugged machine . . . a grinding mill that requires little attention yet provides continuous, dependable performance. Replacing worn grinding media is merely a matter of inserting a couple of rods. Mill liners are easily replaced.

Produces Cubical Product — Rod mill action breaks long, flat particles and knocks rough corners off other particles. This results in a desired cubical product . . . a product that has a definite effect on concrete strength and the amount of cement required.

Affords Specification Flexibility — You can meet varying specifications with an Allis-Chalmers rod mill by changing the rod charge, feed and feed water. Once mill is adjusted to produce a required product, it needs very little attention.

For complete information on Allis-Chalmers rod mills, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 07B6718A.

A-4658

ALLIS-CHALMERS

CONCRETE PRODUCTS

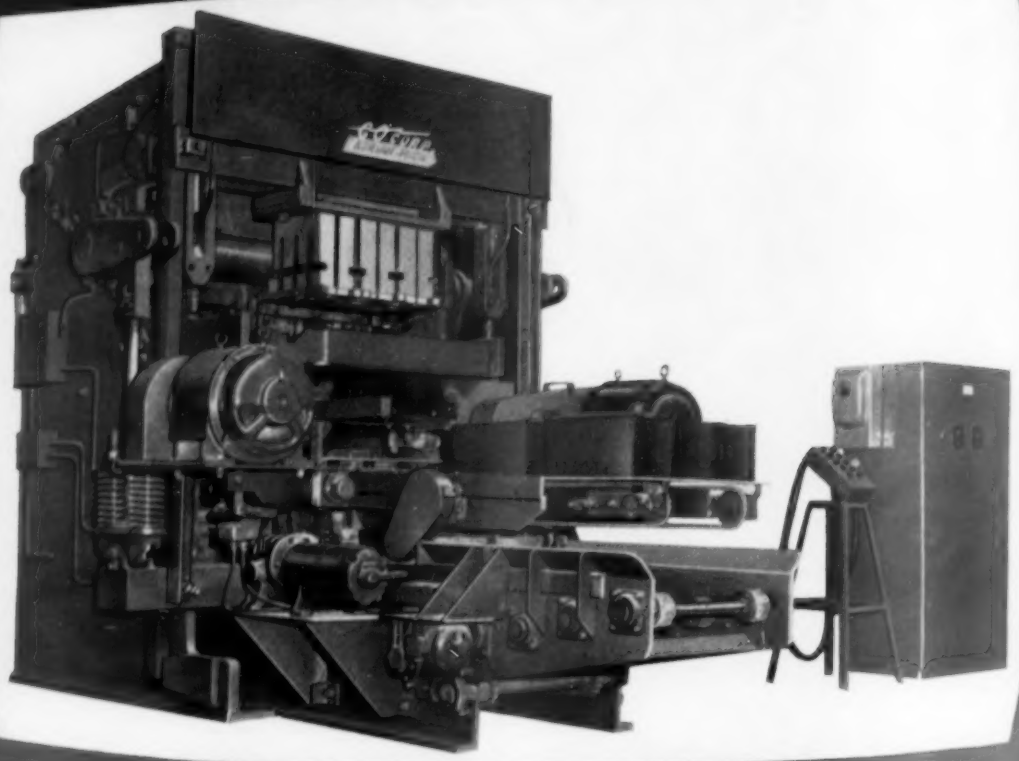
A SECTION OF ROCK PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE

Attractive exhibit of Texas Industries, Inc., at Texas State Fair in Dall

Keep YEARS AHEAD TOMORROW

WITH THE *NEW*



Hydraulic GOCORP "TRUSTEE"

NO DRAWING BOARD DREAM BUT THOROUGHLY FIELD TESTED—THE GOCORP, 3 at a time, PLAIN PALLET, "TRUSTEE" IS READY TO GO TO WORK FOR YOU NOW!

CONSIDER THESE FACTS!!!

- **HIGHER PRODUCTION**—Up to 1100 good blocks per hour, with many aggregates, *without abusing the machine.*
- **TOP QUALITY BLOCKS**—Fewer culls in production • Fewer rejects on the job • Variable cycle—for complete flexibility and constant control of quality • Accurate height control.
- **LOWER MAINTENANCE**—Hydraulic operation means fewer wearing parts • Smoother operation • The elimination of cams, cam followers and gears means big maintenance savings for you.
- **QUICK MOLD CHANGE**—Change full height molds in about 20 minutes—to other heights in about 30.
- **RUGGED CONSTRUCTION**—Heavy duty frame with heavy plate cross bracing — Heavy duty bearings — 5" dia. cross shafts • The "Trustee" is built to last.
- **NO BRAKE FAILURE**—"Trustee" vibrator motors are 10 HP plug reversing type • Designed for frequent stops and starts • No brakes to cause trouble.

The "Trustee" will accommodate, without alteration, molds of the majority of plain pallet machines now in use. You can have all the advantages of the modern *hydraulic* "Trustee" and protect your mold investment too!

Ask about the new GOCORP "Jet"—the 2½ X small brother to the "Trustee".

The "Trustee" machine does **not** replace or succeed the famous GOCORP "Senior" and "King" models.

GO CORP
ADRIAN-MICH.
407 Green Street Adrian, Michigan

INDUSTRY NEWS

Cover Picture

ON THIS MONTH'S CONCRETE PRODUCTS COVER is a view of the Texas Industries, Inc. exhibit at the State Fair of Texas in Dallas. It is a view of the patio, showing basket weave and close-up exterior walls of Holiday Hill Cliff Stone. The open columns are constructed with 4- x 8- x 16-in. Texcrete Haydite masonry units.

Buys Concrete Plant

BLAKNEY CONCRETE PRODUCTS OF MONCTON, has acquired the ready-mixed concrete plant of Bemrose & Kilburns, Ltd., at Fredericton, N.B., Canada, and plans to expand operations with the installation of additional batching and mixing equipment. The firm also produces farm drain tile, chimney block, catch basins and other precast concrete products, as well as ready-mixed concrete.

Concrete Industries Board

READY-MIXED CONCRETE PRODUCERS, sand and gravel suppliers, road and surface contractors, and contract haulers have united in Dallas County, Texas, to form the Concrete Industries Board of Dallas County. The organization, aimed at safeguarding the industries' safety record, was proposed by Thomas L. Amis, president of Wamix, Inc., following a rising incidence of accidents involving sand and gravel trucks. The Board's safety program includes a self-policing system of traffic observers, to spot accident-prone drivers and improve driving practices. A safety meeting was held recently, attended by over 200 truck drivers, featuring safety films and lectures. Police and safety officials paid tribute to the program as the first such effort in Texas history, and noted a sharp decline in the rate of accidents involving sand and gravel trucks since the Board's formation.

Officers of the Board include: Pete Gifford, Gifford-Hill Co., Inc., vice-chairman; J. Randall Cooper, Cooper Concrete, Jerry Lacy, L. H. Lacy Co., Lloyd Van, ABC Concrete Co., Wes Pickens, Wesco, and Bill Handley, Blue Diamond, all members of the executive committee.

Opens Concrete Batch Plants

COLONIAL SAND AND STONE CO., Suffern, N. Y., has started operations at its recently built concrete batching plant at Suffern. This is the most recent addition to the company's 35 plants serving New York City and a large part of New Jersey. It is located on a 1½-acre site leased from the Suffern Stone Co., and is operated by Colonial Bistate Concrete Corp., a subsidiary of the parent company.

The company also has opened a concrete batching plant at West Nyack, N. Y., which, together with the Suffern plant, will serve Rockland and Orange counties. Each plant was built at an approximate cost of $75,000, and has a capacity of 200 cu. yd. of ready-mixed concrete per hour. Equipped with 8000-gal. hot water boilers, the plants can operate year-round. Concrete and water are carried to and mixed at the job site by part of the company's fleet of 490 trucks.

Thomas L. Amis, chairman, Concrete Industries Board of Dallas County, Buster Rowden, Texas Department of Public Safety, and **Charles Batchelor,** Deputy Chief of the Dallas Police Department, look over program for traffic safety meeting, attended by over 200 truck drivers

VERNON MCFETRIDGE AND DALE YOUNG have leased the Joseph Concrete Products plant from Dr. Lyle Ham. The plant is now operating as the Yu-Mac Block & Tile plant, manufacturing pumice and concrete block, building block and drainage tile. Capacity is about 2000 block and 1500 ft. of drainage tile per 8-hr. shift.

READY-MIX CONCRETE CO. recently opened a concrete batching plant in Knoxville, Tenn. The plant has a capacity of 100 cu. yd. of concrete daily. Two-way radios will be installed in company trucks to improve service, according to F. H. Pittenger, manager.

CONCRETE MASONRY UNITS, INC., Williamsdale, Ohio, has sold the controlling interest in its plant to Miami Cement Products, Inc., Seven Mile, Ohio. New officers of the corporation are Henry Wiecke, Dan Newton and Gilbert E. Condo.

ROCKDALE CONCRETE, INC., Miami, Fla., has begun operations at a new ready-mixed concrete plant. W. A. Clamp, Jr., is president and general manager. A. M. Lupfer and C. S. Monroe are vice-presidents, J. D. Monroe, treasurer, and J. R. Rankin, secretary.

THE CANTON CONCRETE PRODUCTS CO. has begun production of solid concrete block for sidewalks, patios and terraces at its new plant in Canton, Ohio. The company also handles a concrete splash-block for rain downspouts and door lintels in 13 sizes.

NORTH SIDE READY-MIX CONCRETE CO. is building a ready-mixed concrete plant on an eight-acre tract of land at Houston, Texas. The plant is one of the three owned by the firm at Houston. James B. Baumgardner is president of the company.

QUARTZITE STONE CO., Lincoln, Kan., has established a plant at the Great Bend airport, for the manufacture of 72-in. concrete pipe.

CONCRETE SUPPLY INC., Morgan City, La., has been incorporated to sell building materials. Capitalization of $50,000 was authorized.

JEFFERSON CONCRETE PRODUCTS INC., Metaire, La., has changed its name to Jefferson Lumber and Concrete Products Co., Inc., and has increased its capital to $73,000.

BELOIT CONCRETE PRODUCTS CO., Beloit, Kan., is expanding its facilities. The company leased a site from the Beloit Chamber of Commerce for constructing a business office and warehouse. Both buildings will be of concrete block manufactured by the company. J. J. Miller is the owner.

More and more manufacturers of concrete block, prestressed concrete, pipe and other concrete products are proving to themselves the *real* savings and increased profits made possible by switching to Ertrane C for their air-entraining agent.

Its' easy to see why. Look at the *exclusive* advantages of Ertrane C over other air-entraining agents:

1. Lightweight—easier handling and storage. Ertrane C is packaged in a 60 lb. multiwall bag.
2. Lower shipping costs. Ertrane C is 100% active; you are not paying freight on water. Also no danger from freezing.
3. Flexibility of use. Ertrane C can be used either dry or in solution. 3 bags (180 lbs.) of Ertrane C into 125 gallons of water make a 15% solution.
4. No additional chemicals required.

So by all means make us prove it. Write today for complete information on ERTRANE C.

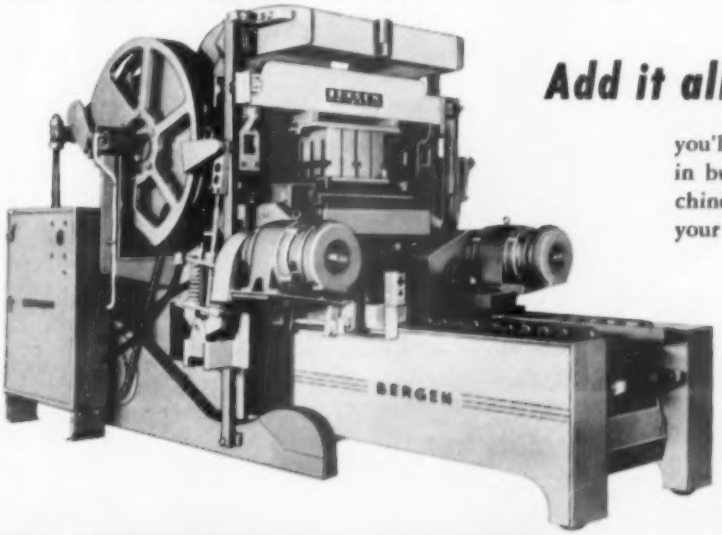
NOPCO

PLANTS: Harrison, N. J.
Cedartown, Ga. • Richmond, Calif.
London, Ont. Canada

it all adds up . . .

with BERGEN'S "know-how"

How do you build a better block . . . increase production . . . ? Block plant operators, everywhere, agree these are essential to successful, profit-making operations. The BERGEN TRI-MATIC is engineered to build . . . more . . . better block. It's super-powered to increase your production up to 6 mold cycles per minute . . . an average production of 10,000 — 8″ equivalent units per 10 hour day.



Add it all up . . .

you'll find BERGEN'S engineering "know-how" in building modern, high-production block machinery will help you increase profits and lower your operating costs.

Write or phone "Collect" for details on BERGEN'S answer to your block plant problems.

BERGEN
MACHINE & TOOL CO., INC.

NUTLEY, N. J.
Phone: NUTLEY (N.J.) 2-7300

PROVED and

The Greatest Profit Maker

OF THEM ALL!

- Reduce Overall Operating Costs with Only ONE Engine to Operate and Maintain
- Mounts on Most Standard Truck Chassis without Alteration of Truck Cab
- Drive Lines Are Located Outside the Truck Frame. Easily Accessible for Lubrication and Inspection
- Shorter Center of Gravity (16" shorter than our standard models) for Use on Shorter Wheelbase Trucks with Better Weight Distribution
- Single "Uni-Lever" Control . . . Starts, Stops, Reverses and Regulates Speed of Mixer Drum
- Standard Industrial Parts and Automotive Clutch and Transmission
- 2-Speed Operation . . . Both Mixing and Discharging
- Final Shock Absorbing Chain Drive to Drum
- Front Engine-Take-Off Approved and Warranted by Most Leading Truck Manufacturers

Thoroughly Developed!

CHALLENGE *Pacemaker* with

"ENGINE TAKE-OFF" Drive

for 5 • 5½ • 6 • 6½ Cubic Yard Models

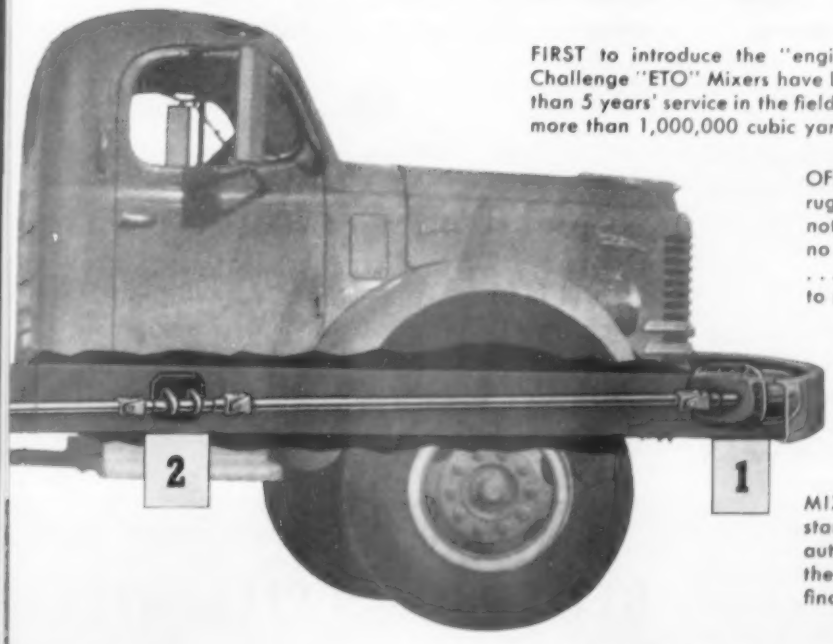
Designed for mounting on most standard truck chassis, without alteration of truck cab, the Challenge "ETO" is a complete unit ready to go . . . nothing extra to buy! Powered by the truck engine, the Challenge "ETO" virtually operates for FREE! Accurate cost records show fuel savings as much as $450.00 per year per mixer . . . ALL NET PROFIT! Think what this would mean in terms of your mixer fleet.

See This Great NEW Challenge Pacemaker. On Display at the NRMCA Show . . . February 13-16.

COOK BROS. EQUIPMENT CO.

Exclusive National Distributor for the Only Complete Line of Truck Mixers on the Market . . . CHALLENGE, Value Standard of the Industry

3334 San Fernando Road, Los Angeles 65, California
Telephone: CLeveland 6-3151



FIRST to introduce the "engine take-off" drive principle in 1951, Challenge "ETO" Mixers have been thoroughly developed during more than 5 years' service in the field, efficiently and economically delivering more than 1,000,000 cubic yards of concrete on all type jobs.

OFFSET FRONT DRIVE (1), enclosed in a rugged, lightweight housing, consists of a notched, high-speed high-strength belt . . . no slippage . . . no complicated adjustment . . . assures an uninterrupted flow of power to mixer drive at all times.

DRIVE LINE (2), installed on the outside of the truck frame where it is easily accessible for lubrication and inspection. Installation does not require alteration of standard truck sheet metal or a specially trained crew.

MIXER DRIVE ASSEMBLY (3), includes standard industrial input drive, standard automotive clutch and transmission, and the PROVED Challenge Gear Reducer to final chain drive.

GOFF KIRBY READY MIX COMPANY DISPATCHES TRUCKS BY RADIO, SAVES MONEY ON HAULING

Cleveland, Ohio Firm Operates 70 Trucks From Four Plants—Finds General Electric 2-Way Radio Helps Keep Costs Down!

Goff Kirby is one of Ohio's largest ready mix concrete firms. Its rolling stock is a familiar sight on construction projects throughout the Cleveland area. Last year, Goff Kirby Ready Mix Company was the only outside concrete supplier to deliver ready mix to the Ohio Turnpike project.

32 Trucks Have G-E Radio!

Nearly half the company's fleet is G-E radio equipped. These drivers are in constant contact with each of the four GK plants. Dispatch orders, changes, and special instructions by radio help make sure that loads get to a job on schedule. When breakdowns occur, the GK repair vehicle is on the scene in record time.

Radio Helps Keep Hauling Costs Down!

Edwin Harper, Goff Kirby president, reports that most of the cost of concrete is in the hauling charges. Typical rental of a concrete truck in his city is $11.50 per hour. By eliminating truck waiting time and driver overtime you save money. General Electric 2-way radio helps keep these costs down.

2-WAY MOBILE RADIO

Radio Can Help Your Operation, Too!

Goff Kirby is a typical example of progressive management in the concrete business. Your G-E Communications Counselor can tell you of others, show you how G-E Progress Line Radio can save you money. Call him in, or, write: *General Electric Company, Communication Equipment, Section X4526, Electronics Park, Syracuse, New York.*

Progress Is Our Most Important Product

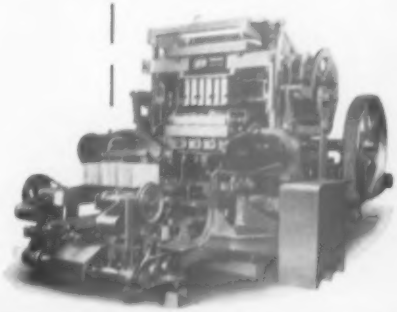
GENERAL ELECTRIC

World Wide Service...

In every corner of the globe, Besser Vibrapac machines are producing high quality block . . . . faster . . . . automatically. And wherever Vibrapacs go, Besser service goes with them . . . . to keep the machines running at peak efficiency and to help meet the ever-growing demand for concrete block.

Vibrapac Block machines are universally acclaimed for their unusual performance records and dependability. They have twice the power of other machines . . . . operate with remarkable smoothness . . . . produce high quality block on a continuous production basis, month after month, year after year. The operation is fully automatic. Green block is power removed. Off-bearer merely guides the power hoist. Elimination of downtime cuts block costs to rock bottom.

More than 50 years of pioneering leadership are back of every Vibrapac machine and the Besser Service that goes with it . . . . your assurance of enduring satisfaction. Contact the Besser representative near you for further information, or write:

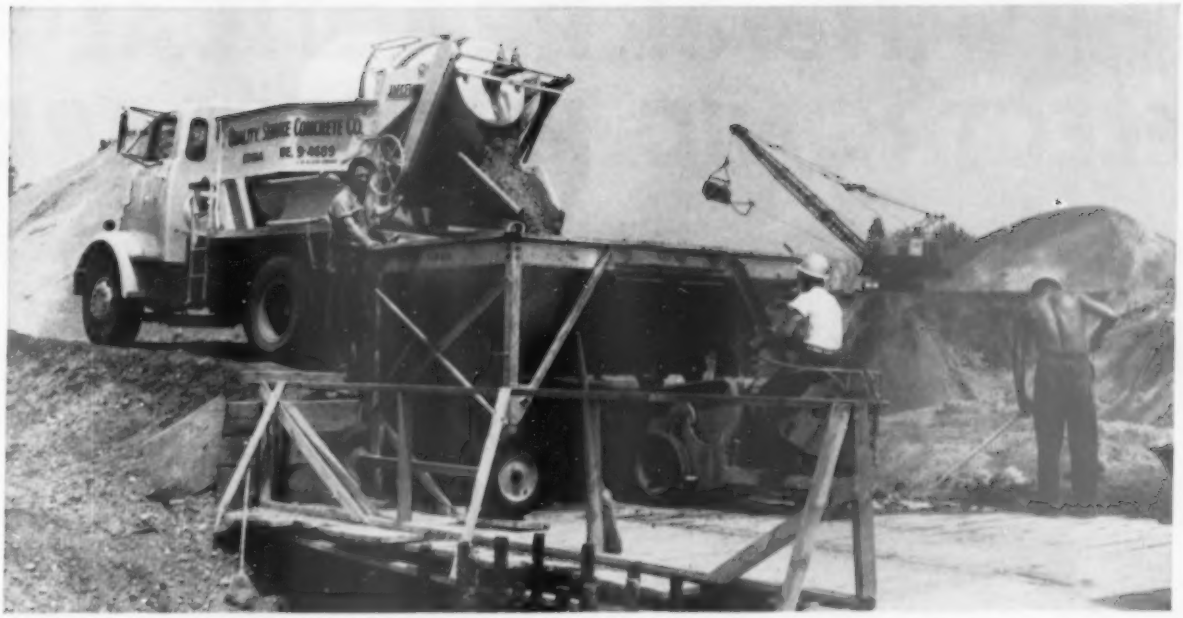


BESSER COMPANY

World's Leading Manufacturer of Concrete Block Machinery

ALPENA, MICHIGAN, U.S.A.

TOP DOOR REMOVES to receive pre-mixed batch in one fast drop. Light, easily handled door is designed for quick opening and closing. Top charging permits use of rear discharge door which completely seals the drum.



ONE HALF-TURN OF A HAND WHEEL (grouped with other rear controls) fully opens discharge door. In transit, this door rotates with the drum, maintaining a metal-to-metal seal against loss of moisture or spilling of concrete. Job pictured here is $10,000,000 Southdale shopping center requiring 40,000 yds. of concrete.

Multiply by 43...all Jaeger

Quality, Service Concrete Co., of Edina, Minn., uses an efficient combination of central mixing plant with top loading Jaeger sealed-drum agitators. With pre-mixed concrete, top loading is, of course, the fastest method. It also permits the use of a closed discharge door which completely seals the drum while in transit. The owners, who also operate another central mixing plant in downtown Minneapolis, now have a fleet of 43 truck agitators, all Jaeger.

More ready-mixed concrete is sold in Jaeger truck mixers than by any other method. As leader, Jaeger offers the only complete line of mixers with choice of open-end or sealed-end loaders or sealed door, and water system and other equipment to fit any operation. All standard 1956 models, from 3½ to 8½ cu. yd., have 3-speed transmission, shorter center of gravity and reduced weight. Your Jaeger distributor knows your local conditions, weight limitations and practices. Check with him or send, today, for catalog.

JAEGER 5′ HOPPER HEAD is ideal for discharging to buckets. Adding chute sections gives further choice of 8′, 10′ or 13′ chute lengths. Hopper can also be swung away or completely removed for direct discharge. Pour pictured is on St. Louis Park high school, near Minneapolis.

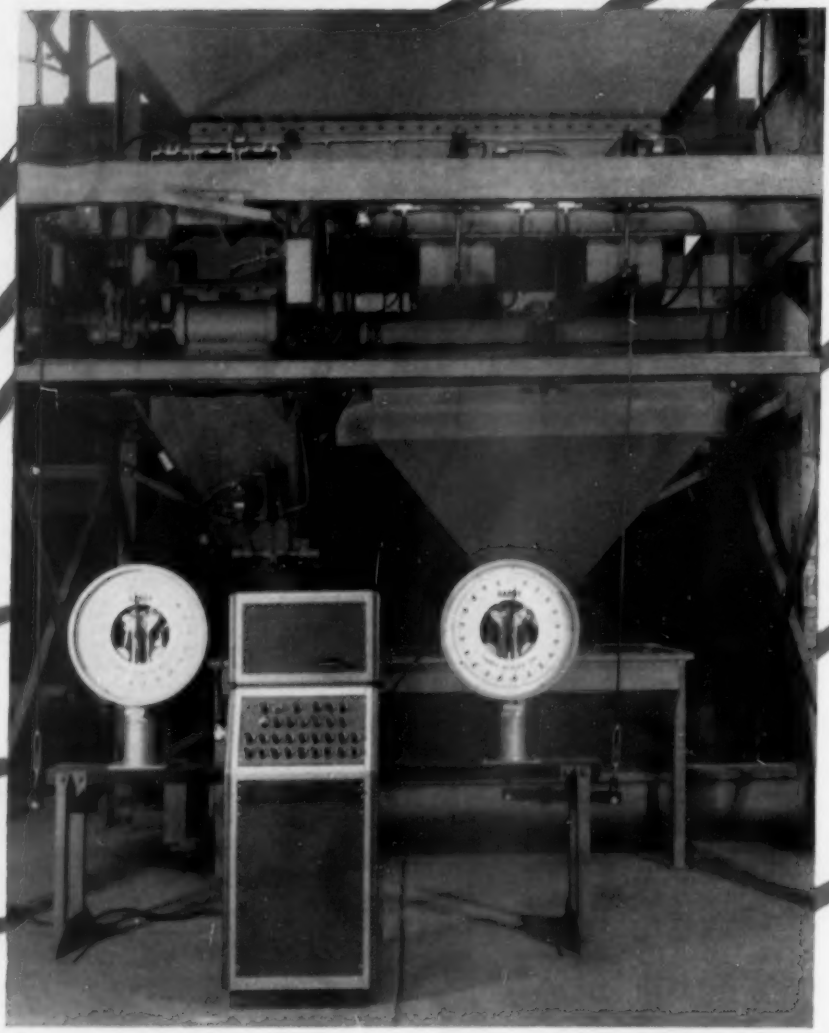
Fleet consists of 43 of these Jaeger units.

THE JAEGER MACHINE COMPANY

603 Dublin Avenue, Columbus 16, Ohio

LOADERS • COMPRESSORS • PUMPS
CONCRETE MIXERS • PAVING MACHINES

It's Here! PRACTICAL ELECTRONIC PUNCH-CARD



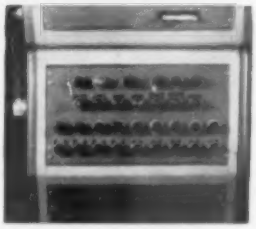
Here's the plant the industry has talked about since the word "automation" was injected into our language. A batching plant that completes all batching operations automatically with a speed and precision only possible with full electronic control. **It is the first punch card electronically operated weighing systems controlled through dial scales accepted by the Bureau of Standards.** It selects any number of materials (automatically compensating for moisture where desired) weighs them out with unparalleled speed to an accuracy that conforms exactly to mix specified and leaves a complete record of the entire process — all in less time than it takes to read this paragraph.

A roomful of electronic controls? Not on your life! That's the beauty of the new Helco-matic Batchmaster System. The entire control system has been simplified and boiled down until it is no larger than a standard filing cabinet. What's more, the design is unitized, functional parts are grouped for the quick and easy replacement. Downtime is eliminated with this system. An entire electronic "drawer" can be disconnected and replaced with a spare in a matter of seconds.

Here's the plant of tomorrow. Years ahead in design and operation, it can save you dollars every way you turn. An office girl can operate it. The cards can be used to keep a running inventory of your materials and to simplify your bookkeeping.

HELCO-MATIC BATCHING

UNLIMITED BATCH SELECTIONS



There are more than 8,000,000 batch combinations—each selected instantaneously. It has automatic and integrated moisture compensation.

AUTOMATIC INVENTORY — ACCOUNTING

Cards can be used to keep your books, simplify accounting, billing, inventory control, cost analysis, etc., with a reduced office staff.

COMPACT FILING CABINET SIZE

No electronic nightmare, but a small filing cabinet-size unit that can be placed any distance from weigh batchers.

UNITIZED FOR EASY MAINTENANCE

Electronic System is grouped and sectionalized for ease of maintenance.

LOWEST COST AUTOMATIC

With all its exclusive features, the new Helco-matic Batchmaster actually costs less than any other plant of its kind.

MEETS ALL SPECIFICATIONS

Entire system is comp... federal and sta...

SEE IT AT THE SHOW!

You can see a full scale working unit of the revolutionary new Helco-matic Batchmaster at the Ready Mix Show in Chicago on Feb. 13, 14, 15 and 16. Make a note to stop by Booths 285, 286, 287 and 288, or contact The Heltzel Steel Form and Iron Co., 1750 Thomas Rd., Warren, Ohio for complete details.

NATURALLY IT'S

HELTZEL STEEL FORM AND IRON COMPANY

62000 THOMAS ROAD, WARREN, OHIO

ELEGANT *Eden Roc*

14 floors concreted with 'Incor' in 13 weeks

'INCOR' REDUCED CONSTRUCTION TIME BY 25%, SAVED $30,000 IN CONCRETING MIAMI BEACH'S NEWEST LUXURY HOTEL

● This year's big news in the wintertime vacation capital is luxurious new Eden Roc Hotel. Blending modern design with the warm beauty of the classical, this $10-million, 14-story, 401-room hotel embodies the utmost in comfort and luxury. Each room, furnished, represents a total cost of $29,000, said to be the highest in the world.

From tropical gardens to top of tower, tallest in Miami Beach, the Eden Roc is outstanding in every detail. Equally outstanding was the contractor's performance in completing this staunch, firesafe structure with its far-from-simple design in record time.

Drawing on many years' experience with concrete-frame erection, the Taylor Construction Company went onto a high-speed 'Incor' schedule on June 15th, topping the structure out September 14th—14 floors concreted in 13 weeks!

A total of 22,000 bbls. of 'Incor' 24-Hour Cement was used, and the Contractor estimates resulting savings of $30,000 on forms and 25% in construction time, with corresponding reduction in overhead costs.

Typical 'Incor'* performance, in a building as noteworthy for structural quality as it is for the elegance of its every external aspect.

*Reg. U.S. Pat. Off.

EDEN ROC HOTEL
HARRY MUFSON, President

Architect:
MORRIS LAPIDUS
New York—Miami Beach

Consulting & Structural Engineers:
H. J. ROSS & ASSOCIATES
Miami

General Contractor:
TAYLOR CONSTRUCTION CO.
Miami

Ready-Mix 'Incor' Concrete:
MAULE INDUSTRIES, INC.
Miami

LONE STAR CEMENTS COVER THE ENTIRE CONSTRUCTION FIELD

LONE STAR CEMENT CORPORATION

Offices: ABILENE, TEX. • ALBANY, N. Y. • BETHLEHEM, PA.
BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON
INDIANAPOLIS • KANSAS CITY, MO • NEW ORLEANS • NEW YORK
NORFOLK • RICHMOND • WASHINGTON, D. C.

LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 18 MODERN MILLS, 38,000,000 BARRELS ANNUAL CAPACITY

AUTOMATIC WEIGHING
Stops Waste In Concrete Block Plant

• National Brick & Supply Co., Inc., Washington, D. C., operating a high pressure curing system and using both silica and cement in the mix, has found automatic weighing of materials more accurate and provides better control of mix

BULK HANDLING can create entirely new problems for production engineers, but the National Brick & Supply Co., Inc., Washington, D.C., found the solution.

When material is handled by 50 or 100-lb. bags, supplying correct weights to the process is no trouble at all. Under a bulk-handling set-up, however, the processor has to weigh out the material, and it is his responsibility to get the correct weight into the process. When the operator is charged with the job of delivering correct weights of material to the process, there is a natural tendency to add a little extra material so no batch will fall short of a vital material. Waste is also created in manually performed operations by the unavoidable inaccuracies of the process itself and by the uncontrolled conditions that are a natural part of such a system.

Correct Overage Losses

At this plant cinder concrete block are made from mixes of cinders, sand, lime, cement and silica. Company officials estimated they were losing several hundred pounds of silica daily in their mixing operation.

Cement was being weighed out in a manually operated hopper scale that was fed by screw conveyor from an outdoor storage bin. When weighing out a batch of cement, the operator frequently went over his prescribed weight, and at times could not avoid waste by spilling and splashing, but the largest losses on the whole were in overages.

Losses in the silica handling operation likewise were predominantly in overages. Instead of being weighed out, silica was dropped into a wheelbarrow through a discharge gate located at the bottom of the silica storage bin.

The loading operator jam-closed the gate when the silica reached a level mark on the inside of the wheelbarrow. He often went over, and frequently spilled and lost material. Besides being wasteful, this method of loading created dust and a potential silicosis hazard. There was relatively less waste in the cement weighing operation, but total losses were higher since the cinder-block formula required almost twice as much cement as silica.

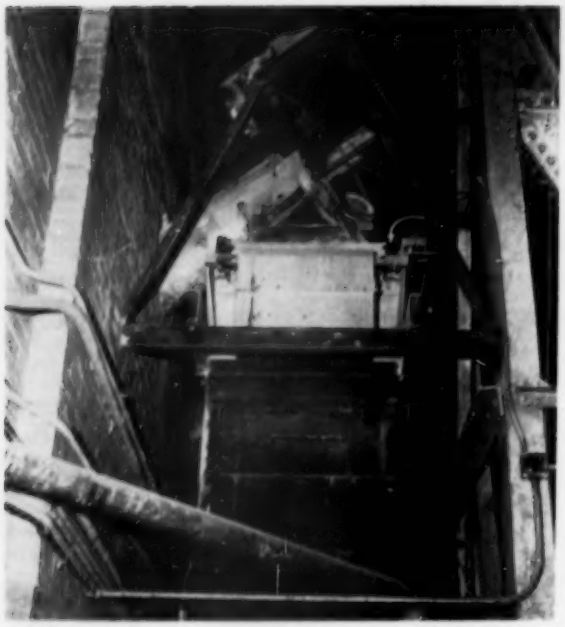
This waste problem was solved by placing the feeding, weighing and handling of silica and cement under automatic controls. In the new operation, the two materials feed into two automatic scales from the two storage bins via screw conveyors. The scales are set to receive a prescribed amount of material, and the screws automatically stop when the correct weight is reached.

When the operator wants to put these materials into the mixer, he discharges the scales, dropping the materials on to a Fuller Airslide which sends them on to the mixer. After the scales are discharged, the screws start feeding again automatically. The timing is such that fresh batches of silica and cement are always on hand for the mixing operator.

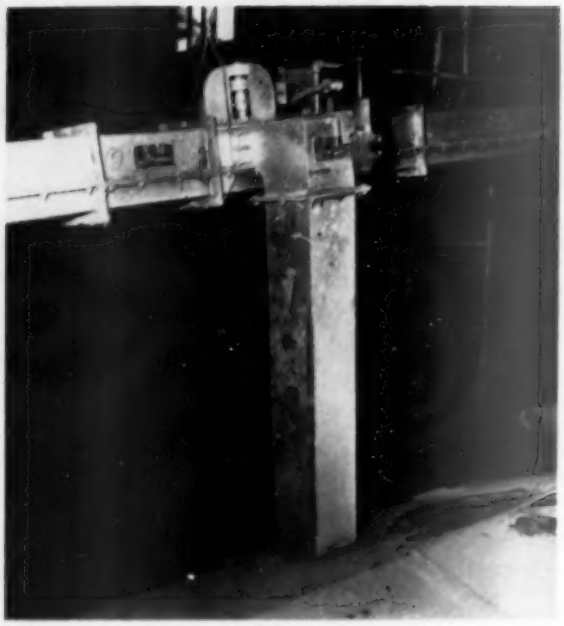
Designed and built by Richardson Scale Co., the two automatic scales are enclosed in a single housing that is equipped with one discharge spout. Both scales are capable of turning out several weighings per minute. They are equipped with radial-type cut-off feed gates, a low-multiplication scale beam, and a weigh hopper with two straight sides for clean discharge.

Construction is dust-proof, and the scales have accuracies of 0.25 to 1 percent of all material weighed. The two are set to deliver 230 lb. of cement and 130 lb. of silica, but may be

Storage bins at the National Brick & Supply Co., Washington, D. C., are loaded with silica and cement at this rail siding. Materials are moved from freight car to bins by the bucket elevator. In the plant cinders, sand, lime, cement and silica are mixed and made in block which are cured in autoclaves



Automatic scale receives cement from screw conveyor on top. Adjacent scale receives silica. The two scales, housed in the same dust-proof unit, are set to receive 230 lb. of cement and 130 lb. of silica, respectively



Airslide receives the silica and cement from the scales and conveys the materials to one of two mixers. Illustration shows valve and discharge line at the first mixer

changed according to the demands of the cinder block mix.

Each scale is equipped with a five-digit setback counter that records total batches of material delivered to the process. With them, and the recording charts, the company has a precise overall check on its daily mixing operation.

Two mixers are used in the National Brick plant. The Airslide line from the scales passes over both mixers. Cement and silica may be discharged to either mixer. The operator selects the mixer by operating a switch on the installation's panel control board. During feeding, the mixer is revolving. Water is automatically fed to the mix; its rate is regulated by moisture control instruments.

After all ingredients have been placed in the mixer, the batch is thoroughly agitated for 5 to 8 min. It is then discharged into a skip hoist and carried up to a hopper located above the block machine. During its two-shift working day, over 300 concrete batches can be made. Cinder block are cured for 8½ hr. in autoclaves with high-pressure steam.

New York Masonry Home Contest

THE NEW YORK STATE ASSOCIATION OF ARCHITECTS, in conjunction with the New York State Concrete Masonry Association, is sponsoring a Concrete Masonry Home Competition, open to architects, draftsmen and students of architecture throughout New York State. The Portland Cement Association will also co-operate in the contest. Cash awards for first, second and third prizes, and ten cash awards for honorable mention will total $3250, offered by the New York State Concrete Masonry Association.

According to Trevor W. Rogers, Buffalo, N. Y., president, New York State Association of Architects, and Henry C. Quaritius, Jr., Brooklyn, N. Y., president, New York State Concrete Masonry Association, the competition is aimed at designing concrete masonry homes within the financial reach of the average home buyer, and to stimulate in the public mind a further desire for architectural services in concrete masonry home design.

Washington Association Fall Meeting

THE CONCRETE PRODUCTS ASSOCIATION OF WASHINGTON held its 27th annual Fall meeting, November 4 and 5, 1955, at Seattle, Wash. A report was given on the completion of the Random Sampling portion of the association's block testing program. Sample blocks had been taken from each producer-member and tested for dimensions, weight, crushing strength and shell thickness. Composite results were not yet summarized, but the tests did indicate that all members were producing a modular block which would more than meet building code regulations.

E. Swanson of the Williams and Mauseth Insurance Agency, spoke on fire insurance rates, pointing out that the use of column block-bond beam system of concrete masonry construction reduced fire insurance premiums to their lowest rate. The problem still remains that the ultimate consumer is not prompting the architect and engineer to design for low insurance rates, as pointed out by Mr. Swanson.

At the Concrete Pipe Manufacturers' meeting a general discussion was held concerning the basic material to be presented in a forthcoming information pamphlet on culverts. Robert K. Lochow, manager of the P.C.A. Seattle office, summarized the six main aims to be considered in designing a concrete mix for machine-made concrete pipe: strength, water tightness, dimensional tolerance, appearance, economy, and limitations of machines.

Office management was discussed at the general meeting, November 5th. Professor K. B. Berg of the College of Business Administration at the University of Washington described the assistance management may receive from cost accounting records. Professor Harry Blythe gave a talk on the various business conditions which guide the extension or restriction of credit, and R. H. Merryman spoke on local merchandising. Social activities included an informal dinner and dance at the New Washington Hotel.

●

THE AMERICAN BLOCK CO., Salt Lake City, Utah, recently installed a 120-ft. high-pressure-steam curing unit.

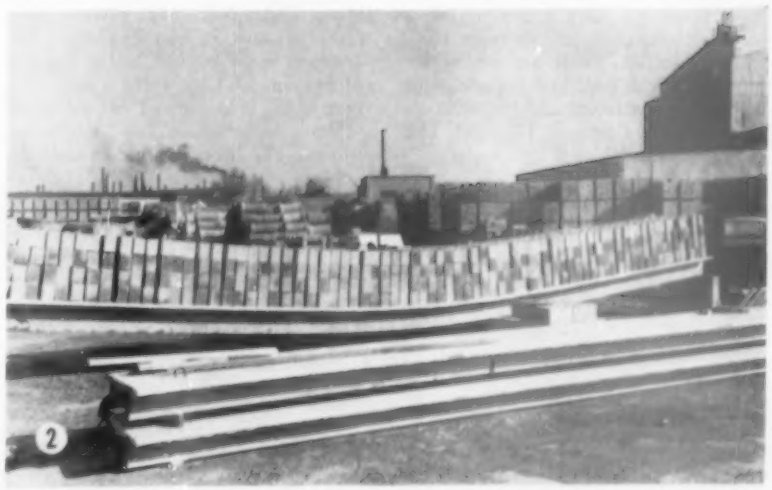
PRESTRESSED CONCRETE Fire and Load Tests

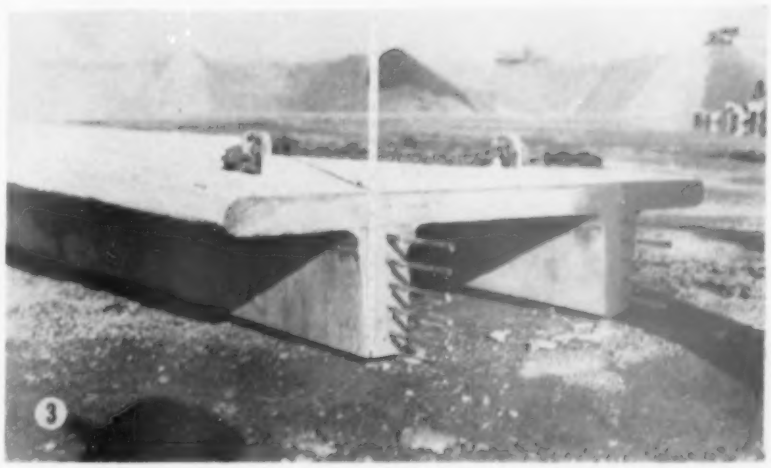
• Frontier Dolomite Concrete Products Corp., Lockport, N. Y., demonstrates strength and fire-resistance of new type prestressed concrete beam

SOME SPECTACULAR LOAD AND FIRE-RESISTANCE TESTS were recently made of pretensioned, precast concrete double T sections by the Frontier Dolomite Concrete Products Corporation, Lockport, N. Y. The demonstration was held on November 21, 1955 before a large group of architects, engineers and contractors. The structural members placed under tests were 42 ft. 8 in. long, using 6000-lb. concrete with ⅜-in. steel cable reinforcing. Steel reinforcing is under 14,000 lb. tension. Frontier is said to be the only manufacturer making the new structural unit in this area.

When tests show that the proper concrete strength has been attained, tension on the reinforcing cable is released and the concrete unit is lifted from the casting bed and shipped to the construction site. Release of tension puts a slight upward curve or camber in the member, imparting rigidity, strength and fire-resistance. It is claimed that this method of fabrication permits a lighter and longer span for the same strength compared to concrete units that are reinforced with mild steel bars.

Two tests were conducted for the engineers, architects, contractors, highway superintendents and other guests. In the fire test, a No. 120 steel bar joist with a steel deck, having a design load of 53 lb. per sq. ft., collapsed after 12 min. The prestressed concrete beam, subjected to a similar load, sagged about a foot but did not give way. In the strength test, a 42-ft. 8-in. pre-





From top to bottom: (1) Fire test made in furnace constructed of concrete block. A 30-ft. prestressed concrete beam subjected to the flames under normal designed load sagged slightly but did not give way. The steel beam, similarly loaded, collapsed after 12 min. of the test. The comparison was made, company officials explained, not to detract from the qualities of steel, but to show that the fire was hot enough to destroy the steel members. (2) A 42 ft. 8 in. prestressed concrete beam being subjected to successively heavier loads. The beam recovered to zero deflection after one and one-half times normal design load and gave away completely only after normal load was quadrupled. (3) Close-up of end of double T prestressed concrete beam, showing placement of reinforcing cable

stressed concrete beam was subjected to successively heavier loads, showing that it recovered to zero deflection after one and one-half times its design load. With four times its design load, the beam bent 1.87 ft. in the middle.

The improvised furnace for making the fire test, built with concrete block, was filled with oil-soaked wood and ignited.

Frontier Dolomite Concrete Products Corporation has constructed a 120-ft. casting bed for double T beams to be used as floor and roof units. Other beds are planned in a $200,000 program which will enable distribution of its prestressed concrete products in a wide area.

PUSH-BUTTON Ready Mixed Concrete Batching Plant

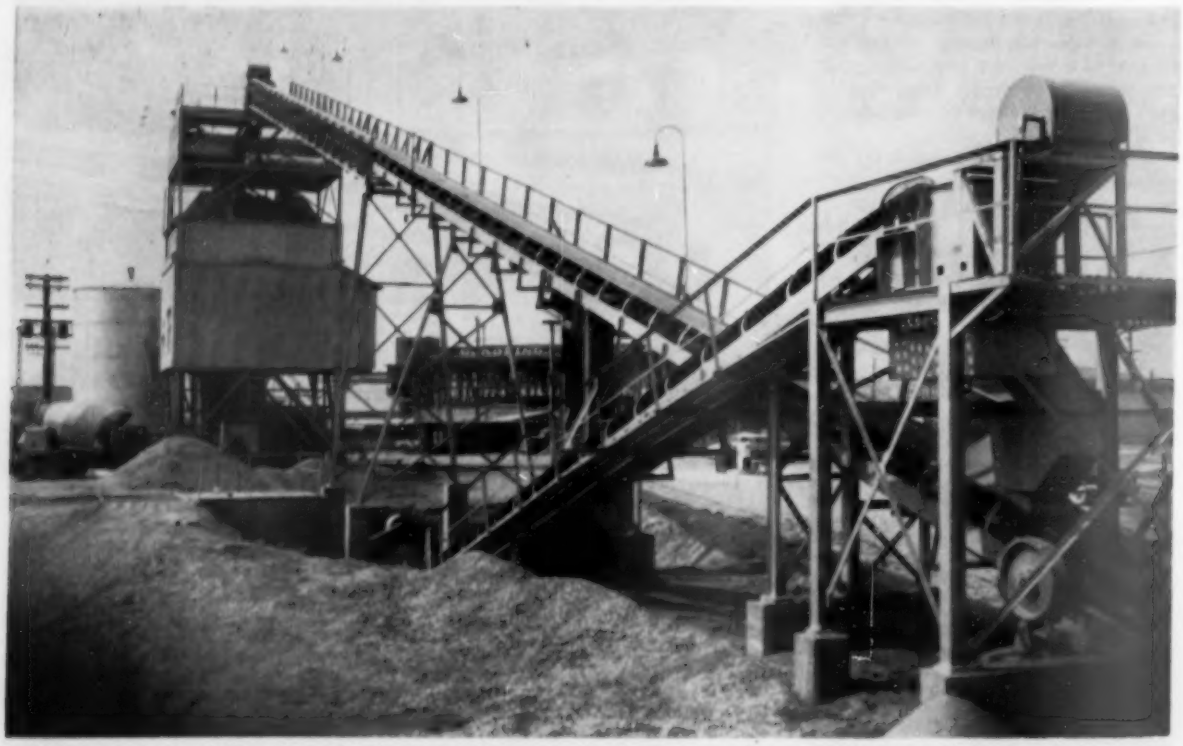
• Livingston Rock & Gravel Co., Inc., opens batching plant in the heart of Los Angeles, Calif., which is equipped with special electric and pneumatic controls

By WALTER B. LENHART

A MODERN READY-MIXED CONCRETE BATCHING PLANT was recently placed in operation by the Livingston Rock & Gravel Co., Inc., Long Beach, Calif., in the heart of down-town Los Angeles. The new plant is only a few blocks from the Union Depot. The plant features a fully automatic Johnson weigh batching set-up, using electric-air controls. There are five Butler bins holding a total of 300 tons with a three-compartment silo for bulk cement holding a total of 1700 bbl. The entire plant is of steel and concrete.

Included in the automatic features are Johnson recording devices for three scales (water - cement - aggregates) so that the time, date, weights, batch numbers, etc., are continuously recorded. Dur-Air, an air-entraining agent, is dispensed by a Liquimatic Systems meter, and a percentage surface moisture indicator is also available. The Johnson scale hopper has a capacity of 6½ cu. yd. City water is used with two surge tanks ahead of the water scales. Motors are all Fairbanks, Morse. The screw conveyor that delivers the cement to its weighing hopper is equipped with a magnetic brake which stops the conveyor instantly, prevents dribbling, and helps reduce the chance of the conveyor stalling or packing from flooding.

Aggregates for the new plant are trucked from the company's sand and gravel plant near Azusa, Calif. Bulk cement is also trucked to the plant. A bucket elevator delivers the cement to the silos with a Conveyor Co. system of belt conveyors delivering the aggregates to the proper bin. The



Sand and gravel is trucked to the ready-mixed concrete plant in Los Angeles from the company's plant in Azusa, Calif. To the rear may be seen one of the 39 mixer trucks pulling into the batching plant for a load

Batching plant operator checking recording charts. To the left, above, is the additive dispensing device, and to the right are some of the electric-air controls

Gathering hopper, above, which is raised and lowered by electric-air controls. Sprays outside of hopper control dispersion of cement dust

company has assigned to this operation seven Challenge mixers mounted on Reo-Cook chassis. A total of 39 mixer trucks of various makes and sizes are available. Sika Plastiment, a retarding concrete densifier additive, is used in some special types of concrete.

Under the weighing hopper is a Likens Mfg. Co. gathering hopper that serves as a connection between the throat of the mixer truck and the scales. The "custom made" gathering hopper is raised and lowered for truck loading purposes by automatic electric-air controls. On the outside of the gathering hopper are several fine water sprays, using water at 125 p.s.i. These sprays function as the portland cement falls into the truck mixer and prevent dusting. The amount of water used by these sprays is very small and no water disposal problem is present.

Carder Livingston is president of the Livingston Rock & Gravel Co., Ralph Wise, vice-president, and Howard Marsh is vice-president and production manager. E. E. Pratt is the plant operator.

Prize-Winning Concrete Masonry Homes

NEW MEXICO CONCRETE PRODUCTS ASSOCIATION has published a folder of 12 prize-winning concrete masonry homes from a competition planned by the association and sponsored by the New Mexico Chapter of the American Institute of Architects and the El Paso Chapter of the Texas Society of Architects. Architects, designers, draftsmen, and students of architecture in the State of New Mexico and the El Paso, Texas, area, competed in the contest for a three-bedroom home with provision for a carport or a garage, attached or detached. The lot was considered to have a frontage not to exceed 60 ft. and a depth of approximately 125 ft. The living area was to be restricted to a maximum of 1400 sq. ft.

Modular dimensioned concrete masonry was mandatory in the construction of exterior walls and chimneys. Concrete masonry units in exterior walls above grade were to be exposed, and interior partitions were to be constructed of exposed or covered concrete masonry.

The folder is available at a cost of 26¢ per copy to members of the National Concrete Masonry Association from the New Mexico Concrete Products Association, in care of Mithoff Advertising Agency, 304A North Stanton St., El Paso, Texas.

New Sakrete Plant

W. R. BONSAL CO., Hamlet, N. C., Sakrete licensee for southeastern U. S., has built a modern 500,000 bag per year Sakrete plant at Ojus, Dade County, Florida. P. D. Cloud is manager. The plant will produce gravel, sand and mortar mixes. There are 21 plants in the U. S. manufacturing Sakrete products, with others in Canada and Australia.

New Sakrete plant of W. R. Bonsal Co. at Ojus, Fla.

New Techniques and Materials

In Prestressed Concrete and Masonry

• American Concrete Institute regional meeting in Atlanta, Ga., included as an added attraction an outstanding exhibit of materials and machinery with 29 exhibitors

ADDING IMPETUS TO A TREND, the A.C.I. Eighth Regional Meeting, held October 31 to November 2, 1955, at the Atlanta Biltmore Hotel, Atlanta, Ga., broke all previous attendance records for regional meetings and emphasized that regional meetings have become an important event in Institute activities. Previous attendance records were exceeded when more than 400 registered from 26 states, the District of Columbia, and two Canadian provinces. For the first time at a regional meeting, exhibits were among the main features, with 29 exhibitors participating.

The technical program was divided into sessions on precast concrete, masonry, construction, and design. The last day was devoted to field trips to various construction projects and manufacturing facilities.

Precast Concrete

George S. Jenkins, J. E. Greiner and Associates, architects and engineers, Albany, Ga., was chairman of the precast concrete session. Thor Germundsson, manager, Structural and Railways Bureau, Portland Cement Association, Chicago, presented a film and commentary on European precast concrete. The rest of the session was devoted to a panel discussion on thin precast concrete. Panel chairman was A. Amirikian, chief design engineer, Bureau of Yards and Docks, Department of the Navy, Washington, D. C. Panel members included K. P. Billner, president, Vacuum Concrete, Inc., Philadelphia; L. P. Corbetta, secretary, Corbetta Construction Co., Chicago; W. H. Baskerville, Concrete Engineering Co., Knoxville, Tenn.; and H. H. Edwards, president, Lakeland Engineering Associates, Inc., Lakeland, Fla.

Mr. Amirikian prefaced the discussion by pointing out the general merits derived from thin precast concrete, with particular emphasis on the attainment of greater economy in the utilization of materials. Mr. Billner described the application of vacuum concrete in thin precast work, followed by Mr. Corbetta who presented the favorable conclusions arrived at by the contractor. Mr. Baskerville outlined the particular applications to plant-manufactured items and their design criteria. Mr. Edwards forecasted the far-reaching consequences of prestressing in altering the properties of concrete and extending its use. Mr. Amirikian concluded the formal presentation by describing the application of thin precast concrete by the U. S. Navy Bureau of Yards and Docks.

One evening session featured several interesting films, including "Lift Slab Construction," presented through the courtesy of Southeastern Lift-Slab, Inc.; and "The Builders" and "New Bridge Ahead," presented by American Steel and Wire.

Concrete Masonry

The session on concrete masonry construction was presided over by Bernard B. Rothschild, Alexander and Rothschild, Architects, Atlanta. R. C. Rittenhouse and W. L. Tefft, chemist and assistant supervisor, respectively, Silicone Product Engineering, Linde Air Products Co., Tonawanda, N. Y., co-authored the report "Performance and Testing of Silicone Water Repellents." After discussing the uses of "waterproofers" and "water repellents", they described some of the characteristics and properties of silicone resin water repellents. Edward Mangotich, assistant engineer, National Concrete Masonry Association, Chicago, discussed "Curing of Concrete Products and Cracking of Masonry Walls."

This session ended with a panel discussion on concrete masonry construction under the chairmanship of W. R. Ireland, president, Atlanta Aggregate Company, Inc., Atlanta. The panel was composed of Dale Cobb, Jackson Ready-Mix Concrete, Jackson, Miss.; Willard N. Lamberson, Bodin & Lamberson, architects, Atlanta; A. E. Lloyd, Alabama Cement Tile Co., Birmingham, Ala.; Mr. Mangotich; and Harry H. Mitchell, Spartanburg Concrete Co., Inc., Spartanburg, S. C.

The construction session, under the chairmanship of Robert E. Stiemke, director, School of Civil Engineering, Georgia Institute of Technology, Atlanta, featured papers on construction materials and notable projects in the Southeast. "Design and Control of Lightweight Structural Concrete," by George H. Nelson, executive vice-president, Law-Barrow-Agee Laboratories, Inc., Atlanta, and Otto C. Frei, president, Georgia Lightweight Aggregate Co., Rockmart, Ga., presented an overall viewpoint on the progress of expanded shale structural concrete in the Southeast. The authors presented test data on expanded shale aggregate from a new source in Georgia. This aggregate is blended or sized in ¾ to ⅜ in., ⅜ to $\frac{3}{16}$ in., and $\frac{3}{16}$ in. to dust, with the gradation conforming to ASTM C330 and C331. Soundness tests of the coarse and fine aggregate were 1.22 and 1.16, respectively. The crushing strength is 2100 to 3400 p.s.i.

In proportioning mixes using this material, the authors noted that the amount of fines used depends on the type of concrete and the amount of air-entrainment. Weights of 70 to 89 lb. per cu. ft. are possible. In structural concrete, the lowest fines and the lowest amount of entrained air consistent with workability are used. When these two factors are at a minimum, harshness develops; and when at a maximum, more water is needed consistent with the amount of entrained air. Air content for best workability varies from 8 percent at 3 sacks per cu. yd., to 3½ percent at 6 sacks, and 1 percent at 9 sacks. The air is entrained for workability in placing the concrete and not for imparting durability to the hardened concrete.

Curves for determining the optimum amount of air entrainment for highest strength were shown; and a design method was suggested which employs a term called "specific gravity factor", eliminating the need for knowing the actual specific gravity of the aggregates or the actual water-cement ratio used. Proportioning of lightweight aggregate concrete mixes is difficult because the absorption, rate of absorption, and specific gravity vary and are not reliably known. Trial batches are necessary to determine cement factor, gradation, air-entrainment, and mixing water required to produce the specified slump.

Charts showed the variation of compression and flexural strength, bond, shear, and diagonal tension in shrink-

(Continued on page 185)

CHAIN BELT

REX

COMPANY

ADJUSTA-WATE
MOTO-MIXERS

LEADERSHIP Looks to Tomorrow . . . Today

The ability to look ahead, work ahead, to the needs of tomorrow, is a characteristic of leadership!

This is the great advantage Rex Adjusta-Wate Moto-Mixers offer you. Rex leadership brings you the "years-ahead" features today . . . gives you those profit-making advantages that keep you ahead of your competition. With Rex, you lead with *your* customers! In many cases, it will be years before you can expect comparable advantages in ordinary truck mixers.

Major improvements cannot be accomplished overnight. Sometimes they take years of experimentation and testing before they are truly ready! Actually, Rex engineers are today working on developments that look far into the future. When they will be ready is difficult to say. For, as the leader, we cannot afford to gamble . . . to let users bear the burden of testing. The progress of ready-mix concrete . . . of truck mixer development . . . is too closely allied with Rex leadership for us to take

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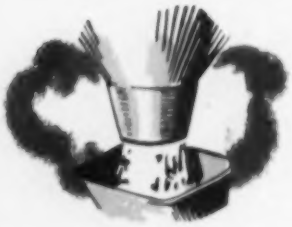
unnecessary chances. BUT, this we can promise — if you want to keep ahead of your competition . . . if you want to give your customers the best in service and quality, you'll want Rex Adjusta-Wate Moto-Mixers. They're as far ahead of the field today as was the first truck mixer we introduced more than 25 years ago. You're always ahead with Rex.

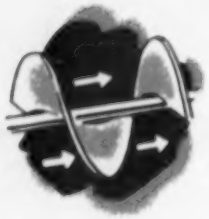
YOU'RE DOLLARS AHEAD . . . EVERY DAY WITH REX® ADJUSTA-WATE

The "years-ahead" design of Rex Adjusta-Wate Moto-Mixers® is built around a simple fact — the *faster* you can charge your mixer, mix the concrete, deliver it and return for another batch . . . the more profit you make. Actual "time tests," under every conceivable type of operating condition, prove that Rex is minutes faster on the complete cycle. Add up the number of trips you make per day and you'll easily see how important these minutes saved per trip are. They mean more trips per truck . . . extra deliveries . . . more customer satisfaction. And, satisfying customers is your best path to profit.



CHARGING

We do not claim Rex will charge faster than any other mixer. But, don't be fooled by claims of charging speed. A few seconds saved at the plant is only achieved by the sacrifice of speed in mixing and discharging, where slowness will cost you minutes. We *do* state that no other truck mixer will equal the over-all speed of a Rex. Rex gives you speed where it counts . . . the fastest trip cycle.



MIXING

No truck mixer will even approach the speed or thoroughness of the Rex mixing action. Speed here is important . . . and quality of mixing is even more important. Your customers demand thoroughly mixed, uniform, top-quality concrete and you give it to them with Rex. The Adjusta-Wate design principle that provides a drum of proper size, shape and low incline also provides the greatest free mixing space — a "must" for quality mixing!

DISCHARGING

Here is where you . . . and your customer . . . appreciate speed. Rex will discharge faster . . . more completely . . . and with a spouting range greater than any other mixer. The Adjusta-Wate design principle *always* locates the *discharge point back of the rear tires* where it must be for effective discharge. Only the Adjusta-Wate principle permits mounting the mixer on any truck to gain this favorable discharge . . . and still retains proper load distribution for maximum pay load.

CONSTRUCTION REX MACHINERY

ONLY THE LEADER

Rex® Adjusta-Wate gives you the important three that add up to fastest operation . . . more trips per day.

ADJUSTA-WATE MOTO-MIXERS®

LEADERSHIP . . . THROUGH CREATIVE ENGINEERING

CHAIN BELT COMPANY

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Litho in U.S.A.

A.C.I. MEETING

(Continued from page 182)

age with various mixes developed for use with the local aggregate.

A brief account was given on the problems of handling, batching, transit - mixing, central - mixing, moisture content control, mixing cycle, and other factors pertaining to the field control of lightweight structural concrete. Because of breakage in handling and segregation, dry batching of the aggregate is not recommended. Spray systems on conveyors moving the material to stockpiles partially soak the aggregate, and upon storage a uniform moisture content is achieved. A batcher is filled from this pre-soaked material.

Winton M. Blount, Blount Brothers Construction Co., Montgomery, Ala., described the $3,500,000 Dauphin Island bridge project near Mobile, Ala., which involved the construction of about two miles of causeway and three bridges totalling 2¼ miles. Two major "cost-cutting" techniques were: (1) precasting the 34-ft. long by 29-ft. wide reinforced concrete roadway slabs in re-usable steel forms specially constructed on barges so that the slabs set and are cured enroute to the bridge site, and (2) utilization of fiberboard forms for encasing the steel bearing pilings below and above the waterline with concrete.

Ready-mixed concrete was used in precasting the deck slabs in the barge-mounted forms, 27 miles from the bridge site. Six barges were used on the job, and three slabs were cast on each barge. The precast slabs were floated into position between bents, and lifted and placed by a special traveling gantry crane which moved forward along the bridge on temporary beams which were removed and moved forward as construction progressed.

In encasing the steel H-beam pile bents with concrete, a job-developed air and water jetting device was used. To counteract reactivity of local aggregates, fly ash was used as a replacement for part of the cement in the concrete, the cementitious material consisting of four parts cement and one part fly ash. The concrete tested 3000 p.s.i. at 7 days and 8000 p.s.i. at 6 months. Sufficient cylinders were made by the Alabama Highway Department for five years of testing after the completion of the bridge.

Construction of the Lake Pontchartrain Crossing Bridge currently underway at New Orleans, La., was described by Kenneth C. Roberts, assistant chief engineer, Palmer & Baker, Inc., Mobile, Ala. Alluvium under the lake required a pile-supported structure. After considering a number of types, selection was made of hollow precast, 54-in. dia., prestressed piles, designed for a 140-ton load. Test piles driven to refusal at minus 80 ft. supported a load of 420 tons with a permanent set of ⅛ in. Because of the 24-mile length of the bridge, provision for temperature length change of 132 ft. was necessary in the bridge.

Because of the multiplicity of similar units and a duplication of parts, the adoption of a highly mechanized system making use of precast elements was essential for economical construction. The hollow piles were constructed in 16-ft. sections and assembled into longer units by the use of post-tensioning units threaded through cores in the pipes. The deck sections were precast in a shore plant and floated out to position for placement on the bents.

To avoid confusion and interference between operations, bridge construction was divided into three phases, each separated by about a week. First the piles were driven, then the bearing caps were placed, and finally the deck sections were installed.

The concrete for the piles was a dry mix consisting of 645 lb. cement, 1450 lb. sand, 1780 lb. gravel, 130 lb. fine sand, and 175 lb. water. Test strengths were 2290 p.s.i. at 6 hr., 4170 at 24 hr., 5495 at 7 days, and 6140 at 28 days. The deck concrete consisted of 611 lb. cement, 1020 lb. sand, 1950 lb. gravel, 290 lb. water, and 3 oz. of an air entraining agent. Strength of 36 hr. was 3550 p.s.i., 4800 at 7 days, and 5110 at 28 days. This concrete was steam cured for 6 hr., then the railing was added and the steaming continued for an additional 6 hr. Forms were removed after a 36 hr. period.

Construction is progressing at the rate of 46 to 50 spans, amounting to 2600 to 3136 ft. or approximately 0.6 mile per week.

A $1,500,000 ten-story apartment building project in Memphis, Tenn., involving the use of the slip-form method, was described by John H. Doggett, architect, Memphis. Because of requirements for on-site parking, the slip-form portion of the structure was started at the third floor with the lower portions being of conventional cast-in-place concrete. The exterior walls are about 8½ in. thick. According to Mr. Doggett, by using slip-form construction and utilizing the working platform as floor forming, construction costs were reduced by perhaps 10 percent and completion of the apartment building was speeded up by 3 to 5 months.

Prof. D. A. Polychrone, Department of Architecture, Georgia Institute of Technology, and structural engineer consultant, Atlanta, served as chairman of the design session. Eivind Hognestad, manager, Structural Development Section, Portland Cement Association, Chicago, presented the paper "Concrete Stress Distribution in Ultimate Strength Design," authored by himself, N. W. Hanson, and Douglas McHenry, all of P.C.A. The investigation reported was conducted with the primary objective of developing a test method leading to an improved quantitative understanding of concrete stress distribution in ultimate strength design.

Design Session

"The tests show," reported Mr. Hognestad, "beyond reasonable doubt that the flexural stress-strain relation of concrete possesses a descending curve beyond the maximum stress. Near the ultimate load, therefore, the concrete stress distribution deviates considerably from the triangular distribution used in the straight-line theory." The test data obtained, he said, demonstrate the reality and validity of the fundamental plasticity concepts involved in ultimate strength theories for structural concrete such as those presented by Whitney, Jensen, and others.

New insights into reinforced concrete theory must usually be derived from research which often leads to purely empirical rather than theoretical relationships, said Prof. Phil M. Ferguson, chairman, Department of Civil Engineering, University of Texas, Austin. He noted that in spite of much recent research, diagonal tension remains perhaps the most unsatisfactory part of reinforced concrete design. Still, he said, this research has yielded notable progress, with results now pointing to definite implications about diagonal tension.

Professor C. P. Siess, research associate professor, Department of Civil Engineering, University of Illinois, Urbana, concluded the session by reviewing "New Concepts Regarding Strength in Shear." This paper was based on the results of tests being made for the Ohio River Division Laboratories, Corps of Engineers, U. S. Army.

The final day of the meeting was devoted to field trips to various plants and construction projects, including the casting yard of Prestressed Concrete of Georgia, Inc., Atlanta; a folded slab roof structure for the Atlanta Housing Authority; Cleveland-Perkerson School, a thin-shell roof and retaining wall; a superb example of concrete finishing at the Abbey of Our Lady of the Holy Ghost; and the expanded lightweight aggregate plant of Georgia Lightweight Aggregate Co., Rockmart, Ga.

Another BESSER Booster*

* This is the 126th of a series of ads featuring leaders of the Concrete Products Industry who are stepping up block production with Besser Vibrapac machines.

Schuster Block Company executives: R. C. Brown, plant superintendent; C. W. Broughton, owner; and James F. Harris, general superintendent.

"There's No Machine on the Market Today that will Stand Up to a BESSER"

These words came from James F. Harris, General Superintendent of Schuster Block Company, Indianapolis, Indiana. Mr. Harris has had considerable experience in the block industry. His high regard for the Besser Vibrapac is reflected in the fact, he recently referred to the Vibrapac as the "Workhorse" of the Industry.

The Schuster Company started in the block business in 1918 with a hand machine. Their first Besser machine was purchased in 1941. This was followed by a Vibrapac machine in 1948, and, as business progressed, two more Vibrapacs were added in 1953, replacing the older models.

Early this year, the Schuster plant was completely gutted by a disastrous fire. Undaunted, the company rebuilt the plant from the ground up, and significantly, equipped the new plant with two new automatic Vibrapacs and two Besser 50 cu. ft. mixers. Within 90 days of the date of the fire, these machines were producing block. Currently, production runs to 18,000 (8" or equivalent) units per day.

One of the two new automatic Vibrapac machines installed in the new Schuster plant. The illustration shows off-bearer removing the green block with the help of a Besser Power Hoist.

The new Schuster plant is a model in block plant design. It is equipped with the most modern facilities, including automatic control devices to increase production with a minimum of manpower.

Before you invest in new block making equipment, be sure to get the complete Vibrapac story . . . from the Besser representative in your locality . . . or write directly to

BESSER COMPANY
BOX 135 • ALPENA, MICHIGAN, U. S. A.
Complete Equipment for Concrete Block Plants

Note Cubing Station in photo (above, right). Besser Bridge Crane Block Cuber eliminates lifting block by hand . . . simplifies inventory count . . . permits neat stockpiling. Besser Cubing Platform, with open steel grating, is self-cleaning.

The new Schuster block plant, built on an adjacent 16-acre site, south of the old plant destroyed by fire.

Yard scene at Schuster plant. Note neat stockpiles due to block cubing. A covered storage is planned for the near future.

BESSER VIBRAPAC

First in Concrete Block Machines!

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PLANT MAINTENANCE

38. A producer views the ready-mixed concrete business. This is the first of two articles on plant maintenance

By JAS. A. NICHOLSON*

WHEN MAINTENANCE IS MENTIONED, we think primarily of the problem of maintaining plant equipment. At any ready-mixed concrete operation, a good many factors beside equipment get mixed up in the maintenance picture. These include access roads, plant driveways, yard layout, plant construction, housekeeping, lubrication, efficiency of operating and maintenance employees, and plant supervision. Problems of plant layout, housekeeping, supervision and efficiency of employes have been discussed in previous articles. Lubrication will be discussed as problems of individual pieces of equipment are considered.

The access roads should be of such construction as not to give the mixer trucks a beating or add in any way to the burdensome dust problem. As many producers have learned, a good way to build satisfactory roads economically is through the use of returned concrete. The original roads are meant to be temporary; forms along the permanent entrances and exits are always ready to receive concrete. No producer should ever adopt a policy of just dumping concrete returned in trucks. Either use returned concrete advantageously in building up roads and structures around your plant or use the concrete in producing some kind of a saleable item.

A critical point of road construction is the driveway or driveways through the plant. All driveways should be sufficiently wide. The slab through the plant should be placed slightly above ground level so that drainage will be away from the operation. To help trucks so that they will be properly centered for loading, it is good thinking to install curbing guides. See to it that proper precautions are taken against concrete build-up. The splashing of concrete (especially at a mixing plant) unless given regular attention, will soon build up an interference both vertically and horizontally.

At one of our operations, concrete build-up on two plant supporting walls (10 ft. apart) became such a problem that employes had difficulty driving trucks through the plant. Build-up had reached the point where getting out of a truck parked in loading position had become an impossibility.

Too many producers suffer from the hazards of narrow or depressed driveways and bracing interference. The matter of vertical clearance has become a problem common to many producers as this industry continues to go to larger capacity truck mixers (higher, too) in a seemingly endless attempt to overcome ever increasing operating cost. On several occasions, I've told salesmen that I can't use their bigger mixers because of headroom limitations. They all come back with the same answer — "lower the driveway through the plant". At most plants, that is generally the cheaper way out. Raising a plant costs money. Whenever a driveway is depressed, a producer faces the aggravating problem of getting rid of water and materials. There is a grade to climb. Unless it is impossible or costs are prohibitive, make vertical changes elsewhere. Depress the driveway only as a last resort.

As the new, bigger truck mixer reaches higher toward the weigh hopper or plant mixer, make certain that structure bracing does not interfere. Wherever this condition has been allowed to exist, there have been serious consequences.

Many producers have started in business using portable material bins. As volume increases and bigger truck mixers are placed in use, the first thought is how to increase the capacity of the plant. With little concern, plant legs are lengthened, bigger weigh hoppers are installed, and sides of bins are built up. The services of a competent structural engineer should always be secured to approve any plans for increasing plant capacity or to check on any structural remodeling.

Bin bracing should be checked twice a year and immediately after any mishap wherein any structural members have been bent or otherwise damaged. Never permit any weakening of a bin structure to go unnoticed. I know of several incidents where the financial stability of a ready-mixed concrete operator has been imperiled because of sizable expenses (including lawsuits) that followed a collapse of cement or aggregate bins. If in doubt on structural soundness, stop the operation until you get a "go ahead" from a competent engineer. In this or any other phase of operations, a producer should never take a chance on personnel safety.

A concrete plant is basically composed of storage bins, several kinds of equipment for handling concrete materials, and one or more weigh hoppers, including accurate scales. In the case of a central mixing operation, a plant mixer is added equipment.

Aggregate and Cement Bins

As a protective measure, the exterior of all bins should be painted regularly every 1 to 3 years. The interior of any bin compartment should never be painted. The same admonition applies to all surfaces on which concrete or other materials are expected to slide or otherwise move. The interior of bins should be cleaned out periodically (dependent upon conditions) to remove any hardened material that resists flowing. On bin care, producers generally find that the cement bins require more frequent attention. The presence in bins of moisture hardened cement sooner or later leads to trouble with the screw conveyor charging the weigh hopper. Even without trouble, hardened cement doesn't belong in your concrete. If this moisture hardened cement is regularly accumulating in the cement bins, study unloading practices (protection against rain and snow) and make certain that all bin joints are weather tight — use plastic caulking compound or roofing cement.

The condition of bin walls and partition splash boards should be regularly checked. Any situation leading to infiltration of aggregates must be carefully avoided. Sides of bin compartments should be replaced before they are so thin that holes are likely to develop. Our employes remember well a low test on concrete that led to the discovery there was a breakthrough in the bin wall, with sand finding its way into the stone compartment. There is no excuse for such negligence.

At many plants, air jets are used to keep cement fluffed up and free flowing. Unless a sufficiently big receiver is installed, moisture originating in the air compressor finds its way into the cement bin and hardens cement. When the bin interior is being cleaned, care should be taken to remove any hardened cement that has collected around the air jets. The recent use of low

*Pres., Nicholson Concrete Co., Toledo, Ohio.

pressure (3 to 5 lb.) air compressors, together with air pads, has generally ended the possibility of moisture trouble originating with bin aeration.

The sides of all bins should be so constructed as to overcome the angle of repose. Sides of cement bins necessarily must be steeper than those of aggregate bins. Even when bins are properly constructed, the use of damp sand may prevent normal flowing of materials. The employment of electric or air vibrators may be required to keep cement and aggregate flowing freely. When their use can't be avoided, vibrators should be given regular care in accordance with manufacturer's instructions and a replacing unit should always be kept on hand.

This point should be made. If bins and weigh hoppers are properly constructed and only sand of low moisture content is elevated to overhead storage, vibrators are not necessary. At our newer plants, no vibrators are used anywhere; nor have we experienced any hanging up of materials.

Full bin indicators, especially for the cement bin, provide excellent protection against bucket elevator downtime. When cement is forced back into an elevator, serious trouble needlessly develops. Unless bin indicators, through regular maintenance, are kept in proper operating condition, their use should be discontinued. No load of cement should ever be started up an elevator unless the responsible employe knows definitely that the overhead bin has room for the cement to be elevated. Either keep the bin signal working efficiently or don't depend upon it. A number of producers consider it good practice to require an assigned plant employe to keep close check on cement movement at all times and tell him that if he is in doubt to make an inspection through the manhole in the bin roof.

The efficiency of bin gates and weigh hopper discharge gates can be impaired by wear, bending, and corrosion. Unless gate material construction is sufficiently strong, a gate will soon be bent out of position. Abrasive aggregates cause gate wear. Moisture in the aggregates causes gates to corrode. On one occasion, we experienced difficulty in accurately weighing out a load of "topping" concrete. The ⅜-in. stone and smaller sizes kept dropping into the weigh hopper. Inspection showed that all bin gates were badly bent. The comparatively new gates had been made out of relatively thin stock and all had to be replaced. Until the weighing incident occurred, there had been no report by responsible employes on the faulty condition of the bin gates. We had purchased inferior equipment, in the use of which the quality of our concrete was being endangered; our plant employes had been careless in maintenance work and in failure to make required reports. Finally, in early replacement of gates, we were forced to extra expense and avoidable downtime.

Cement Handling Equipment

At concrete plants, deliveries of cement are made by rail, truck, or barge. In both rail and truck shipments, an underground (rail-under track) screw conveyor is generally used to take the cement from the hopper car or bulk truck to the boot of the cement elevator. Recently, in both types of shipments, the Air Slide has come into common use as have air activated tanks on a more limted basis. Also, where plants receive all cement deliveries by bulk trucks, a common, although questionable, practice is to discharge the cement into a hopper, feeding directly into the boot of the elevator. Plants using screw conveyor equipment to unload cement and receiving both rail and truck shipments, generally go to a longer screw equipped with two separated receiving hoppers — one for rail shipments; the other for bulk truck deliveries.

If a pit is required for the screw conveyor, its construction should be water-tight. A lockable, weather-tight removable cover should be provided. Provision should always be made for quick, easy removal of water and free moisture from the pit. After each rain or whenever moisture gets into the pit, free water should be removed before the equipment is operated. The pit should be so constructed that the screw conveyor can be easily inspected, cleaned, lubricated, and repaired. The screw itself should be equipped with a sectional, easily removable, weather-tight steel cover.

Trouble with hardened cement in overhead storage bins sometimes originates with the construction, operation, and care of the undertrack screw conveyor. The screw should be so constructed and positioned as to keep water and moisture out of the conveyor's interior. At its charging end, the screw should be completely protected against weather and the possibility of foreign material getting into the conveyor system. In affording protection against the admission of foreign material, a screw or grid should be used. These protective devices should be magnetized or a separate magnet should be installed to pick up loose pieces of iron and other metal that too frequently come out of cement delivery equipment.

The two bearings located at the head and foot of a screw conveyor should be lubricated daily. Any equipment used to handle cement needs frequent lubricating attention. If bevelled gears are used in the drive of the conveyor, a heavy gear compound should be regularly used. The interior condition of the screw should be given a weekly inspection or more frequently if conditions warrant it.

In handling the last load of each day, it is always good practice to run the screw and elevator for several minutes after the cement has been discharged into the overhead bins to make certain that all the cement has cleared the conveying-elevating equipment. This affords good protection against the cement hardening problem.

Conveyor equipment should be so hooked up that the use of a shear pin or other protective arrangement prevents the spread of damage in case any form of obstruction occurs. Chains and sprockets should be given careful inspection and recommended lubrication procedures should be carried out. Bearings in cement handling equipment need greater care than is normally recommended by manufacturers. Bearings used in cement elevators get rough treatment. Weekly lubrication may be the manufacturer's recommendation. Under conditions that prevail at some ready-mixed concrete operations, these bearings may need lubrication twice daily. Unless this equipment is frequently given carefully considered, thorough attention, unexpected, expensive down-time is certain to develop.

Very few operators who have been in this business a long time have escaped the anquishing experience of having a tangled mass of chain and buckets all jammed up in the bottom section of a cement elevator. Study made too late by top management generally shows that the inspection doors have not been used and that worn chain parts have not been replaced. A periodic inspection might have shown that the elevator was out of line, binding was occurring, buckets were loose, or that chain bars were showing excessive wear on one side. One man should be given the responsibility of regularly inspecting and reporting the condition of this important equipment. During the winter period the elevator should be reconditioned for a full year's use.

The only answer to unnecessary elevator downtime is through regular inspection and thorough care. Each bolt used to attach a bucket to an elevator chain should have its head within the bucket. Ends of bolts should be peened over to prevent the buckets from becoming loose. Damaged buckets should be replaced. Even if no replacement bucket is available, a

(Continued on page 190)

new-design PAYLOADER® cuts ...handling time 1/3

Concrete Ready-Mixed Corp. serves a 15-mile radius around Roanoke, Virginia. Their "PAY-LOADER" scoops-up material from stockpiles and carries and delivers it to a receiving hopper. The unit handles about 33,000 tons of sand annually in addition to smaller percentages of stone. D. G. Lindsey, Supt. and Vice President, says,

"We thought our old HA 'PAYLOADER' was efficient, but the new-design HA has cut handling time more than one-third. The torque converter saves wear and tear on tires and machine — is also easier on the receiving hopper. Our old 'PAYLOADER' worked 9 years."

There are proven models in the complete "PAYLOADER" line to meet the needs of ready-mix and concrete products plants—also big 4-wheel-drive units up to 2 cu. yd. for digging, stockpiling, truck loading and road maintenance in pits and quarries.

Both front-wheel-drive and 4-wheel-drive sizes have the efficient new Hough bucket action with 40 degree roll-back at ground level that gets bigger loads easier—carries bigger loads faster, more safely. All "PAYLOADER" models are full of features and advantages that result from Hough's pioneering and greater experience in tractor-shovel manufacture.

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Your nearby Hough Distributor is ready to help you select the "PAYLOADER" that best fits your needs.

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☐ model HF (1 cu. yd.) ☐ model HFH (1⅛ cu. yd.)

Four-wheel-drive
☐ model HO (2 cu. yd.) ☐ model HH (1½ cu. yd.)
☐ model HU (1 cu. yd.)

Name .....
Title .....
Company .....
Street .....
City ..... State .....

Batching Plant Maintenance

(Continued from page 188)

damaged bucket should be immediately removed.

Through the inspection door, elevator chains should be regularly examined for tautness. If chains can be brought into contact with each other, the chains should be tightened by means of the takeup at the head of the elevator. When chains are loose, capacity of the elevator is cut down and chains ride the sprockets causing rapid wear.

As with the screw conveyor, housing of the cement elevator should be regularly checked for weather tightness. Felting material should be used to seal the joints. The elevator should be equipped with a safety ladder to provide easy access to the top of the unit for lubrication of the headshaft and adjustment of the take-up.

A matter of grave concern develops when buckets coming around the head shaft of the elevator fail to discharge their contents into the bin chute. When cement in quantities begins to come down the backside of the elevator, its efficiency is decreased with downtime, even chain breakage is likely to occur. At the point where the buckets come over the top to throw the cement into the discharge chute, there should be a gap of approximately one inch between the buckets and the inside surface of the elevator section. This gap is controlled by an adjustable throw plate. The gap may become too wide and need adjusting. Other mechanical problems may occur. Speed of the elevator may be increased or decreased. Cement characteristics may change to such an extent that operational modifications become necessary.

Any cement elevator operates most efficiently at a certain speed. It is always good policy to list in a record the speed that a unit is designed to be run so that when trouble comes, a comparison can be quickly made. When a bucket elevator is run at a speed different from that for which it was designed, cement may miss the discharge chute and land back at the boot of the elevator.

After operating one elevator successfully for two years at a speed that unloaded a 100-bbl. cement bulker in 20 min., we ran into a stretch where unloading time began to exceed 90 min. Other production variables led us to early suspicion of the cement. In elevating a load of another brand, handling time was reduced to 45 min., but getting back to the expected 20 min. unloading time was out of the question. Changing the size of the sprocket or other attempts at altering the speed of the elevator produced no appreciable benefits. Adjusting the gap at the top corrected nothing. We finally lowered the opening (making a bigger chute opening) and unloading time immediately returned to normal.

Change in cement characteristics was probably the start of the trouble, as it was definitely noticed that the cement had become quite fluffy. However, we had no record of the speed at which the elevator had been running successfully for two years, and lacking that comparison, we never did know for sure whether the speed of the elevator had changed or had been changed. Through a change in the basic construction of the elevator, we found a correction even through the cause of the trouble continued to be a mystery.

In a previous article, we have pointed out the wisdom of setting the base of a cement elevator on a concrete foundation, the top of which should be slightly above ground level. By doing away with a pit, the water problem is eliminated, housekeeping becomes less of a chore, lubrication duties are somewhat reduced, and there are fewer breakdowns.

If a screw conveyor is used to bring cement from overhead storage to the weigh hopper, similar care is required to that to be given the underground screw conveyor. In most urban plants, the cement screw is inclined at a slight angle (stay away from too steep an angle) and is equipped with electrical two-speed controls for automatic cut-off. Whenever automatic controls are used, copies of the wiring diagram should be kept on file to avoid complete dependence on one electrician whose services may not be available when prompt relief is needed. If a gear head electric motor is used to drive the conveyor, the oil level should be maintained with regular applications of the recommended oil.

The many uncertainties connected with a bucket elevator operation require that a number of replacement parts should always be kept on hand. Several buckets, a small length of chain, some bolts, a few shear pins, an extra sprocket, and two bearings—one each for the boot and headshafts should always be available.

Throughout the industry, air is now being used to transfer and elevate cement. Rail and truck deliveries of cement are being made in air activated tanks. Some of the new plants are being equipped with Airslides instead of screw conveyors. The cement shortage has forced producers to build their own silos to store cement available in the winter season or other slack periods. A number of these operators are going to an adaptation of the Fuller-Kinyon system and finding an efficient economical solution to their cement handling problems. These tools should be operated and maintained in strict accordance with manufacturer's instructions.

Before directing attention to aggregate handling equipment, weigh hoppers, material scales, and plant mixers, it might be worthwhile to take into consideration some general aspects of plant maintenance.

At every ready-mixed concrete operation, a complete card index should be kept on all pieces of equipment. Listed on individual cards, should be be such basic information as name of manufacturer, serial number, identity of parts that will probably need replacement, list of suppliers who can furnish parts, suggested replacement parts inventory, and a summary of instructions for operation and care of the equipment.

Whenever a parts manual and instruction book have been issued on a piece of equipment, a copy of each book should be on file and readily available to key maintenance employes. An instruction book of operation and care of equipment that is accumulating dust in a producer's office will not be of much help. Alert operators use manufacturer's instructions in training employes properly to operate equipment; this information is also used in planning inspection, lubrication, and other service duties.

A producer should start his maintenance planning when he purchases and installs new plant equipment. The completed plant should be rugged, free from bottlenecks, efficient, adaptable to expansion, and easy to clean, lubricate, and service. When installing new equipment, a producer should make sure that things are ready to go before having a final run. This initial inspection should be thorough and complete. All moving parts, couplings, bearings, grease fittings, safety devices, wiring, and control equipment should be double checked. After equipment has been placed in operation, follow-up checks should be regularly made.

Carelessness in operating and maintaining equipment is apparent at too many concrete plants. There is a lack of housekeeping; lubrication duties are handled on a hit-and-miss basis; there are no regular inspections; and some parts are given absolutely no attention. Equipment is not used; it is abused.

(Continued on page 194)

"We tested three mixers...

then bought Worthington HI-UP"

Now *there's* a thumping endorsement of Worthington Hi-Up Truck Mixers. It comes straight from the J. B. McCrady Company of Verona, Pa.

McCrady put a Worthington Hi-Up and two other mixers right to work on the job. McCrady watched their performance, checked the quality of distributor service, too. Let President John B. McCrady tell you the outcome himself:

"We do not believe there is a better mixer manufactured. Excellent service along with splendid field help by Worthington was responsible for our purchase of 3 more Worthington Hi-Up Mixers."

What convinced McCrady? Features that helped deliver *better* concrete *faster* — engineered weight distribution for maximum legal payload . . . speedy discharge, even with low-slump concrete . . . and a really *rugged* transmission. Speaking of the transmission, it's *specifically designed* for a truck mixer. Single-lever operation, too.

Call your distributor now

Make arrangements today to see Worthington MIXERAMA — either working from your batching plant or from a Ready-Mix plant in your area. You'll be glad you did — almost as glad as you'll be when you can call one of these hard-working truck mixers your own. Worthington Corporation, Concrete Machinery Division, Section R.5.2, Plainfield, N.J.

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"That's what it takes in a truck to keep rolling in our business"

...reports Hall Sand and Gravel, Inc., Denver, Colorado.

"We bought our first Reo in 1945, a used Dumper and it's still on the job. It proved to us that, dollar for dollar, there's no better truck to be bought.

"*Rugged strength* in a truck is a prime factor in our business, and Reo really has it. We wonder how they can take such punishment. No other truck has the guts that's built into these trucks.

"Our short-run stop-and-go hauling, requires more gear shifting than an over-the-road haul from Denver to Chicago. This is tough on a truck engine, and we've never had an engine failure in all the time we've been operating Reos."

Reo specializes in custom building heavy-duty trucks for tough jobs like those in the construction business. On or off-highway models with gas or LPG Gold Comet Engines—sixes or V-8's, from 107 to 220 h.p. Reo's advanced *short-stroke, wet-sleeve* Gold Comet engines are available in rugged Reo chassis or for replacement. *They are all backed by a 100,000 mile or 1 year warranty.*

THE HALL FLEET OF REOS delivers sand, gravel and concrete in the South Denver area. As much as 2,000 tons of sand and gravel and 338 yds. of concrete per day.

FOR "REAL GUTS!"

Hall's Reo "transit mix" model A630, 220 h.p., is equipped with a 6 yd. mixer (44,400 lbs. GVW). It saves 30 minutes per trip on a 20-mile run up an 8% grade, from Denver to Castle Rock. Rolls without laboring at 40 miles per hour on the highway.

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WORLD'S TOUGHEST TRUCK

TRUCKS, BUSES AND GOLD COMET ENGINES FOR ORIGINAL EQUIPMENT, INDUSTRIAL AND REPLACEMENT—GAS OR LPG

PLANT MAINTENANCE

(Continued from page 190)

An operator should know the limits of plant equipment and hold its operation within those limits. If an engine (or motor) is to be run at a certain speed, to run it much faster or slower might harm the unit. If a crane is a ¾-cu. yd. machine, it shouldn't be equipped with a 1½-cu. yd. bucket; nor should 20 ft. be added to the boom unless the unit is built to take it. An operator should consult with people who know before using equipment in any way other than its intended application.

At efficient plants, proper operations and planned systematic attention replace last minute repairs and frequent, unnecessary breakdowns. The plant men, equipment superintendent, and maintenance employes communicate freely with one another; any indication of impending trouble is promptly reported; and corrective procedures are immediately undertaken. By having replacement parts, necessary material, and proper tools always on hand when there is any repairing or overhauling work to be done, downtime is held to a minimum.

Standardization

In purchasing new equipment, a multiple plant operator should consider the many advantages of standardization. Where component parts are the same at different plants, maintenance personnel training is simplified, the replacement parts bill should be considerably reduced, and it is easier to inter-change plant personnel.

Similarly, if feasible, any operating procedures or maintenance routines that work effectively at one plant should be duplicated or closely copied at other operations. Where identical equipment is being used at different plants, operation and care should be comparable; it is not good policy to depend upon the opinions and whims of individual plant employes.

At too many plants, maintenance routines aren't planned at all. There is no real thinking behind the work that is done or how it is done. Such inefficiency doesn't belong in your operations. Protect the investment in plant equipment by planning and carrying out an effective maintenance program.

Be on the lookout for new developments in maintenance procedures. Make good use of helpful hints suggested in trade magazines. Welcome suggestions from employes. Properly award those who present good ideas. Find out how others in the industry are handling similar problems. Don't stay with methods, equipment, or products just because you've always used them. If something new and better comes along, put it to work for you.

Ready Mixed Concrete Safety Contest

NATIONAL READY MIXED CONCRETE ASSOCIATION has announced the results of its 1955 Safety Contest (covering the period July 1, 1954 to June 30, 1955). Winners are as follows: Class A—(companies producing more than 100,000 cu. yd.), Fischer Lime & Cement Co., Memphis, Tenn.; Class B—(50,000-100,000 cu. yd.), Stewart and Nuss, Inc., Fresno, Calif.; Class C—(25,00-50,000 cu. yd.), Lake Cities Corp., East Chicago, Ind.; and Class D—(less than 25,000 cu. yd.), Central Builders Supply Co., Sunbury, Penn. The Class A and Class B winners were also winners in 1953.

Each winner will receive a *Pit and Quarry* safety trophy at the N.R.M.C.A. convention in Chicago, Ill., in February. In addition, Certificates of Achievement in Safety will be given to the following Class B, Class C, and Class D companies, each of which had accident-free records during the contest period.

Class B

Arrow Sand and Gravel Co., Columbus, Ohio
The Buffalo Sing Co., Inc., Buffalo, N. Y.
Builders' Concrete, Inc., Muncie, Ind.
Pinellas Concrete Products Division, Pinellas Lumber Co., St. Petersburg, Fla.

Class C

Austin Ready-Mix Concrete Co., Austin, Minn.
Beckley & Myers Concrete Co., Springfield, Ohio (Third consecutive year)
Coon Certified Concrete, Luzerne, Penn.
Fort Dodge Concrete Co., Fort Dodge, Iowa (Second consecutive year)
M. J. Grove Lime Co., Frederick, Md.
Kenyon Materials Co., Inc., Bremerton, Wash. (Second consecutive year)
Kuhns Concrete Co., Springfield, Ohio (Second consecutive year)
C. W. Shirey Co., Waterloo, Iowa (Second consecutive year)
Transit-Mix Concrete Co., St. Paul, Minn.

Class D

Alvin Building Materials, Inc., Alvin, Texas
Beckman Supply Co., Hammond, Ind. (Third consecutive year)
Bluffton Ready Mix Co., Bluffton, Ind.
Cayll's, Inc., Waukesha, Wis.
Certified Ready Mixed Concrete Corp., Keokuk, Iowa
Chaussee-Swan Gravel Co., Boise, Idaho
Concrete Materials, Inc., Morristown, Tenn.
Corvallis Sand & Gravel Co., Corvallis, Ore. (Third consecutive year)
William E. Dailey, Inc., North Bennington, Vt. (Second consecutive year)
Edgerton Ready Mix Concrete Co., Edgerton, Wis.
Feeney Construction Co., St. Joseph, Mo.
Foley Ready Mix, Colfax, Wash.
Gethmann Concrete & Material Co., Gladbrook, Iowa (Second consecutive year)
Helena Sand & Gravel Co., Inc., Helena, Mont. (Fifth consecutive year)
Howell's Ready-Mixed Concrete Co., Parsons, Kan. (Third consecutive year)
Joplin Cement Co., Joplin, Mo.
E. C. King Contracting, Ltd., Owen Sound, Ontario, Canada (Third consecutive year)
Knitt Construction Co., Viroqua, Wis.
Lake George Material & Supply Co., Inc., Hobart, Ind.
Lakeland Concrete, Inc., Hartland, Wis.
Land Construction Co., St. Joseph, Mo.
Maxymillian, Inc., Adams, Mass. (Second consecutive year)
May Coal & Building Material Co., Independence, Mo. (Second consecutive year)
Maysville Ready Mix Concrete Co., Maysville, Ky. (Fifth consecutive year)
Mesaba Construction Co., Hibbing, Minn. (Fifth consecutive year)
Mooney Bros. Supply Co., New Castle, Penn. (Sixth consecutive year)
Randecker Brothers, Lock Haven, Penn. (Fourth consecutive year)
Shamokin Ready Mixed Concrete Co., Inc., Shamokin, Penn. (Sixth consecutive year)
Shawnee Ready Mix Concrete & Asphalt Co., Plymouth, Penn. (Fourth consecutive year)
Sinelli Sand & Gravel, Detroit, Mich.
Union Concrete Block Co., Union, S. C.
Union Sand & Supply Corp., Painesville, Ohio
Wagoner Supply Co., Salisbury, N. C. (Second consecutive year)
Wells Ready Mixed Concrete Co., Wells, Minn.
Wentzville Concrete, Inc., Wentzville, Mo. (Third consecutive year)
Woodward-Pollack Lumber Co., Coldwater, Mich. (Second consecutive year)

All production and distribution employes of the four trophy-winning companies will be awarded a Certificate of Accomplishment in Safety.

A record number of companies (262) enrolled in the 1955 contest; the previous high was 202, in 1953. These companies produced 25,668,321 cu. yd. of concrete during the contest period.

Prestressed Concrete

THE AMERICAN CONCRETE INSTITUTE has published the 1955 edition of "Bibliography on Prestressed Concrete." Over 2100 American and foreign literature references on prestressed concrete, published from 1896 into 1955, are listed. A separate section lists 75 United States, British, German and French patents. The 103-page format is punched for filing in three-ring binders. A supplement is also available for those who purchased the 1954 edition, containing the material added to the new edition. The 103-page edition is available at a cost of $2.00, and the supplement may be had at a cost of 35¢ from the American Concrete Institute, 18263 West McNichols Road, Detroit 19, Mich. The book was prepared as a part of the work of ACI-ASCE Committee 323, Prestressed Reinforced Concrete.

Sound Insulation Booklet

THE NATIONAL CONCRETE MASONRY ASSOCIATION has published a booklet entitled "Sound Reduction Properties of Concrete Masonry Walls," containing test data and discussion from 43 sound transmission loss tests and six sound absorption tests on various concrete masonry wall types. The tests were conducted by the Riverbank Acoustical Laboratory of the Armour Research Foundation, Illinois Institute of Technology.

Buy Concrete, Gravel Plants

AUTOMATIC GRAVEL PRODUCTS CO. and Bi-Crete Pre-Mix Co., Muscatine, Iowa, have been purchased by W. G. Block Co., from Fred O. Block of Bettendorf, Iowa. The plants are being operated by Acme Fuel and Material Co., a subsidiary of W. G. Block Co. Acme officers are W. W. Moeller, president; George Koenigsaecker, vice-president; C. A. Manwaring, treasurer; and M. M. Tiedemann, secretary.

FORT WORTH SAND AND GRAVEL CO. V. P. CHARGE OF SALES, GEO. A. MEIHAUS, SAYS:

"Radio saves us $10.00 a day per truck"

Chief radio dispatcher Coy Anderson gives instructions to a driver miles away.

Mixer driver Alvin E. Hobbs has just received instructions to proceed directly to his next job without going back to plant.

From his mobile repair van J. A. Markham talks directly to drivers, often diagnoses trouble so driver himself can make emergency repairs.

READY MIX OPERATORS:

HERE IS CONSTANT CONTROL OF 51 TRUCKS OPERATING BETWEEN 5 PLANTS

Diverting trucks as needed to handle the output of five separate mixing plants was a king-size job. But Motorola 2-way radio has reduced it to everyday routine for the Fort Worth Sand and Gravel Co. of Texas.

Constant radio control—every minute of the day—of every one of the 51 mixers has resulted in a *saving* of about 20% in mileage per yard of delivered concrete. Drivers get their new orders *at the job site*, and usually go *directly* to the next job without needless travel. Radio actually gets an *extra hour* of bonus production daily from every truck.

Besides speeding delivery and giving better customer service, Motorola 2-way radio has cut costs many other ways. Overtime of drivers and batch plant personnel has been slashed at Fort Worth. Telephone "hunting" by drivers has ended . . . reports are sent and orders received right in the cab. One radio equipped service van does the work of two . . . speeding repair and cutting down-time.

Five supervisors, out most of the time in their radio equipped cars, have instant contact with the main office. Meihaus says his company wouldn't be without 2-way radio now.

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PRESTRESSED CONCRETE
—New Developments Here and Abroad

• First national Short Course in St. Petersburg, Fla., sponsored by Prestressed Concrete Institute and the University of Florida, draws attendance from 19 states, District of Columbia and five foreign countries

By C. E. WRIGHT

THE FIRST NATIONAL PRESTRESSED CONCRETE SHORT COURSE was held last fall at St. Petersburg, Fla., under the co-sponsorship of the civil engineering department of the University of Florida and the Prestressed Concrete Institute. Florida's selection for this short course was considered fitting because (1) many of the charter members of the Prestressed Concrete Institute are Floridians; (2) approximately 70 percent of all the prestressing steel used in the United States in 1954 was used in Florida, and (3) the construction of the 15-mile prestressed concrete Sunshine Bridge over Tampa Bay "had an important part in the development of prestressed concrete in this country," according to W. E. Dean, engineer of bridges, Florida State Road Department.

Supervisor of the short course was A. M. Ozell, associate professor of civil engineering, University of Florida, who prepared a special bulletin on "Prestressed Concrete Design," which was used as a textbook for the lectures and discussions occupying two days of the conference. The third day was devoted to delivery of papers by six experts in the field. Total registration was 293 from 19 states, the District of Columbia, Canada, Panama, Cuba, the Philippines and Formosa. The formal sessions were presided over by R. W. Kluge, head professor of the civil engineering department at the university, Dr. Ozell, and George W. Ford, president of the Institute. The classroom and discussion portion of the course was divided into 10 groups.

Much of the class room work was devoted to structural design rather than to materials and their fabrication. The most comprehensive discussion of prestressed concrete manufacture was a paper, "Design Concepts," by Harold B. Wenzel, structural engineer, Portland Cement Association, Atlanta, Ga. Mr. Wenzel stated that prestressed concrete must be 30, 50 or even 100 percent stronger than that which is being used for other types of concrete construction. Consequently, more time and effort must be expended in the design of concrete mixes to achieve this strength. Greater care in selection of aggregates, in control over batching operations, and in handling, placing and curing concrete are needed. However, he added that the same laws of mix design apply to prestressed concrete and other forms.

Increasing Concrete Strength

Mr. Wenzel referred to four characteristics to consider in the design and handling of plastic concrete for prestressing, including: strength, low drying shrinkage, low creep under stress, and a uniformity or mass homogeneity. The latter must be maintained through batching, mixing, transportation, placing and final consolidation in the forms.

Means of obtaining greater concrete strength, particularly early strength, were outlined as follows:

1. Lowering water content in proportioning through use of richer mixes, larger aggregate, better graded aggregate, and stiffer consistencies.

2. Lowering water content by extraction through use of pressure, vacuum, spinning, and absorption.

3. Accelerating rate in gaining strength through use of high early strength cement, accelerating admixtures, and curing at elevated temperatures.

Regarding the extraction method, the speaker said that pressure, vacuum, and spinning have been used successfully in prestressed work. In the vacuum system, suction pads or perforated forms within a manifold are used through which excess water is withdrawn by means of applying a vacuum. Various tests have been made available showing increased strength due to extraction of water; 30-day strengths have been increased 100 percent and 28-day strengths by 50 percent. Use of high early strength cement gives strengths in one day and three days that would require three days and seven days, respectively, with normal cement.

Regarding curing, Mr. Wenzel referred to laboratory tests indicating that two-day and three-day strengths of specimens cured at 212 deg. F. were double and more the strength of those cured at 63 deg. F., whereas the strengths at 28 days were virtually the same for both temperatures. It is also interesting that tests have indicated the possibility of swelling and cracking when temperatures were too high and when too rapid temperature rises were experienced. He added that high temperatures without a steam saturated atmosphere will also result in higher early strengths. However, when this method is resorted to, care should be taken, since the higher temperatures will accelerate the loss of mixing water and thus may bring on difficulties with respect to drying shrinkage.

Drying shrinkage and creep were next discussed by the speaker. These are largely functions of the cement water paste and are closely related. He said, "As mixing water enters into chemical combination with the cement, a portion of the water is used in the gel and the remainder is available for evaporation. As evaporation takes place, the paste loses volume. Uniform evaporation through the cross-section of the concrete can be expected to produce some stresses, even though the concrete be unrestrained from loss of volume, inasmuch as the particles of aggregate will not undergo the volume change of the paste. If, however, evaporation proceeds more rapidly in some areas, as from a surface, higher stresses may be expected. There is, therefore, considerable advantage to be realized from eliminating those higher stresses due to uneven drying, and from delaying a portion of the stresses expected from even drying until the paste has had the opportunity to develop strength. This result comes from proper curing.

"As the paste will lose volume from drying, it will also change volume from sustained stresses, either those resulting from shrinkage or those due to

(Continued on page 200)

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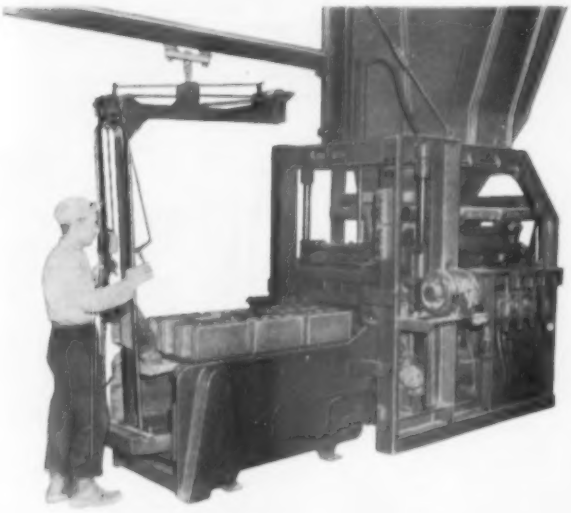

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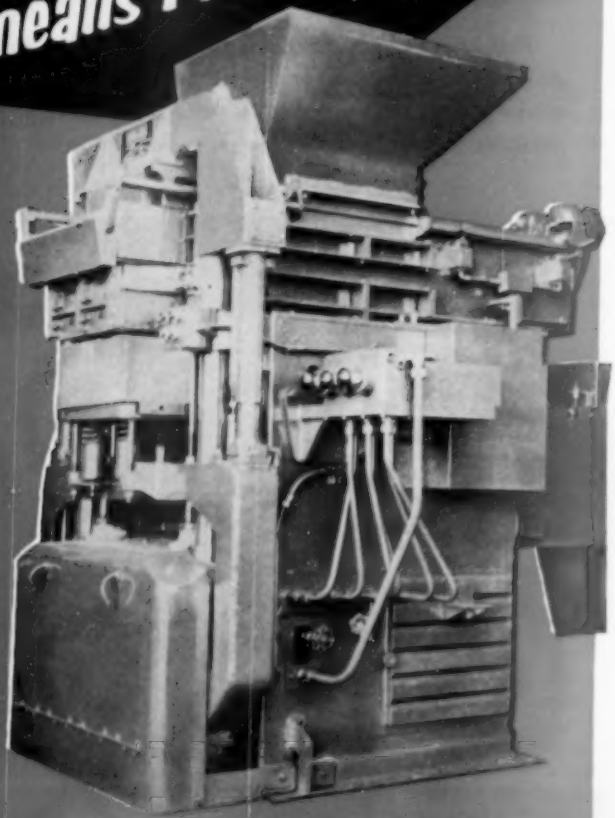

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New Block—Prestress Unit Plant

● CONCRETE BUILDING UNITS CO., Kansas City, Mo., recently began operations at a new concrete block plant in Harrisonville, Mo., producing approximately 5000 concrete block daily. Various sizes and shapes are manufactured to meet A.S.T.M. specifications, as well as "Grade A" requirements for concrete block, set up by the construction industry. A plant was also built at Harrisonville for the manufacture of prestressed concrete beams and prestressed concrete channel slabs in lengths up to 50 ft. Facilities are also being added for the production of glazed block, and a precasting plant, a material warehouse, an office, laboratory and sales store will be built.

The operations at Harrisonville are consolidated under the name Concrete Building Products Co., a subsidiary of Concrete Building Units Co. The parent company has marketed its products under the trade name "Vibracrete" in Kansas City and surrounding areas in both Missouri and Kansas.

A ten-acre tract of ground was made available by the Harrisonville Civic Association for construction of the concrete operations, and strategically located highways and railroads form a network of transportation facilities for delivering the firm's products.

Arthur Haiman is general manager of the Harrisonville firm, and has been with the company more than 15 years. William A. Kim of Harrisonville has been associated with the firm as expeditor, and Lisle Moore is production supervisor.

The firm was organized 33 years ago by John L. Strandberg, Sr., who is also president of the company. He has served on many committees of the National Concrete Masonry Association and the American Concrete Institute, and is also a past-president of the National Concrete Masonry Association, serving two terms in that office. John L. Strandberg, Jr. is vice-president and secretary of both Concrete Building Units Co. and Concrete Building Products Co. He has been active in civic and trade associations in Kansas City and in both states of Kansas and Missouri. Both men have been active in the construction industry all their lives, utilizing concrete masonry to build everything from large apartment buildings and flour mills to private homes. At present, however, the only buildings they construct are for their own use.

Safety Emphasis Necessary

● THE NATIONAL CONCRETE MASONRY ASSOCIATION recently reported an accident at a member plant, demonstrating the need for a planned safety program.

An employe with over nine years experience in the manufacture of concrete block was cleaning a concrete block machine and caught his right sleeve on a pin on the feed drawer agitator while the machine was cycling. This pulled his arm directly under the pressure head and over the mold box. The pressure head lowered on the entrapped arm and crushed it to such an extent that an amputation below the elbow was necessitated.

The machine was equipped with a control box, convenient to the offbearer, containing off-on switches for the feed agitator, the drive motor and the cycling mechanism, as well as positioning switches for the vibrator and the agitator. A red light at the front of the panel indicated when power was on, and as an added safety measure, the owner of the plant had installed a separate power switch above the panel which, when thrown off, would cut all power to the panel controls. Typed instructions, prominently mounted at the panel location indicated that the power switch be turned off prior to cleaning or working on the machine.

First Prestressed Concrete Short Course

(Continued from page 196)

external loads. These volume changes are believed to account for most of the volume changes in concrete, although their magnitude is affected by other factors such as water-cement ratio, volume of paste, and character of the aggregate. For poorer materials and under extreme conditions, the loss of the steel due to shrinkage and creep may be in the order of 50,000 p.s.i. On the other band, by proper selection of materials and by proper mix design, these losses may be more nearly 15,000 than 50,000 p.s.i.

"It appears that for the normal range of mixes used in prestressed concrete, the richness of the mix has little effect upon drying shrinkage. Drying shrinkage seems more a function of the amount of water which must be lost by evaporation. For a given rate of drying, and other things being equal, the magnitude of creep is proportional to the stress, to the volume of cement paste, and to the water-cement ratio. It is therefore clear that for minimum shrinkage and creep, the volume of both cement paste and mixing water, and the water-cement ratio should be the minimum consistent with producing a fresh concrete with such desired properties as consistency, workability, plasticity and freedom from bleeding. A very high cement content will increase the volume of the paste and will increase the total volume of mixing water; therefore, although it decreases the water-cement ratio and increases the concrete strength, a high cement content will lead to both shrinkage and increased creep. Extremely rich mixes appear, therefore, to be generally undesirable."

Mr. Wenzel also stated that gradation and mineral characteristics of the aggregate effect the magnitude of drying shrinkage and creep. The aggregate should be well graded from fine to coarse, and the lower the percentage of voids and the larger the maximum size of aggregate, the better. The aggregate should also be hard and dense and have low absorption and high modulus of elasticity. The best guide to the most suitable proportions of aggregates will best be determined by trial mixes, he said.

The use of admixtures which may increase early strength, reduce the water requirement, improve workability and reduce bleeding and segregation, is also advantageous and desirable, provided these admixtures do not at the same time increase drying shrinkage and creep. The use of admixtures should be approached with caution, he said, since it has been found that some admixtures do not behave the same for all cements and all concrete mixes. However, the speaker pointed out that recognized and approved air-entraining agents do not appreciably effect either shrinkage or creep. Their use is beneficial provided the quantity of entrained air is kept under close control.

Mr. Wenzel also discussed the need for placement of concrete free from segregation and homogenous from top to bottom and from end to end. To achieve this, he said, it is necessary to have a fresh concrete which is plastic and workable and which will hang together under vibration and will maintain the larger particles in suspension and reduce water gain to a minimum. To produce concrete with these characteristics requires proper mix design and efficient job control. Grading of aggregates should be uniform. Batching and mixing operations and equipment should be such that the concrete is homogeneous as it leaves the mixer. The method of transporting the concrete from mixer to form should be such as to minimize segregation.

For example, segregation at the point of discharge from the mixer can be corrected by providing a down pipe at the end of the chute so that the concrete will drop vertically into the center of the receiving bucket, hopper or car. Similar provisions should be made at the ends of all other chutes and conveyors. All hoppers should be provided with a vertical drop at the discharge gate. When discharge is at an angle, the larger aggregate is thrown to the far side of the container being charged and the mortar is thrown to the near side.

He added that concrete should not be placed in large quantities at a given point and allowed to run or to be worked over a long distance in the forms. This practice results in segregation because the mortar tends to flow out ahead of the coarser material. It also results in sloping work planes between successive layers of concrete. Concrete should be placed in horizontal layers of uniform thickness, each layer thoroughly compacted before the next is placed. The use of vibrators to move the concrete horizontally should be effectively discouraged.

The speaker concluded with a discussion of the use of lightweight aggregates in prestressed concrete construction. He looked for an increased use of certain lightweight aggregates, including clays, slates and shales expanded in a kiln and expanded blast furnace slag. Advantages include increased fire resistance, decrease in dead weight, and attractive color and texture of the concrete surface. An important characteristic of lightweight aggregates is that the particles are extremely angular, thereby reducing workability of the concrete. This can be overcome by lubricating the mix with such materials as blow sand, diatomite, and air-entraining agents.

Another important characteristic is its high absorption, which is caused by the porosity of the individual particles. Because of this porosity, it is inadvisable to mix concrete with dry aggregates, he said. The aggregate should be wetted or come from prewetted stockpiles, and water should be introduced into the mixer and mixed before the cement is added. The water-cement ratio should not be considered on the basis of total water added, but rather on the basis of water in addition to that required for absorption.

He added that the slump test does not have the same meaning for lightweight concrete as for heavy concrete. As a matter of fact, some have held that the slump test is largely meaningless for lightweight concrete. For example, a one or two-in. slump for lightweight concrete may mean the same workability as a four or five-in. slump for heavy concrete.

Proper Curing Essential

The speaker remarked that proper curing is essential in obtaining the best performance from lightweight concretes. He said that it is easily possible for adverse weather conditions to cause sufficient mixing water to escape from the concrete to allow incomplete hydration and hence low quality concrete.

Like ordinary concrete, the strength of lightweight concrete can be varied within limits, Mr. Wenzel said. Lightweight concrete girders have been made with a 28-day strength of 6000 p.s.i. In comparing concrete, he said that the durability of lightweight concrete may be as good as that of heavy concrete, and the weight may vary from 90 to about 105 lb. per cu. ft. The drying shrinkage for lightweight concretes is slightly greater than that for most heavy concretes. The modulus of elasticity, or the elastic deflection under load, varies with the compressive strength, ranging from about 55 to perhaps 70 percent of the modulus of heavy concrete of the same strength. This lower modulus of elasticity is important in the design of lightweight concrete members, both because it means increased deflection and because it affects the matter of creep and the modulus of elasticity and shrinkage.

(Continued on page 204)

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NEW MACHINERY

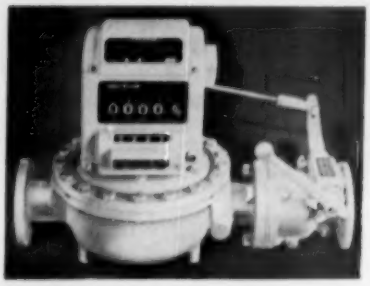
Industrial Lift Trucks

THE YALE & TOWNE MANUFACTURING CO., 11,000 Roosevelt Blvd., Philadelphia 15, Penn., has announced the KGA51 series of industrial lift trucks equipped with Yale torque transmission for fully automatic gear shifting. Built in capacities from 3000 to 8000 lb., the trucks have dual brake pedals so the operator may operate the inching control with his left foot while the right depresses the accelerator for lift or attachment action.

Transmission overheating is said to have been eliminated by providing a large oil reservoir, running oil lines through an auxiliary radiator and applying fins to the lines. Oil cooled, oversize, duplex type, hydraulically operated clutches are utilized, and the transmission gears are in constant mesh with wide face helical gears for greater strength, quietness and smooth operation. The entire transmission unit can be removed from the truck without disassembly, and the clutch discs can be replaced without removing major components since they are accessible by the removal of the transmission housing cover.

Special Trailer Unit

UTILITY TRAILER MANUFACTURING CO., Los Angeles, Calif., has developed a special combination set of trailers for delivering bulk cinders, sand, or gravel and cinder or concrete block. A gasoline motorized traveling elevator facilitates loading and unloading of finished block. A pallet load of block can be handled, without pallets, being raised from ground level and carried forward by the traveling elevator for placement on the trailer. A 50 percent reduction in vehicle movement is also said to be achieved by double-stacking. Special gondola bottoms are utilized by lifting the trailer floor, which then forms gondola sides, ready for filling with bulk cinders, sand or gravel. The trailer design permits delivery of raw materials in bulk to the block plant, and use of the same equipment to deliver the finished block to the job.

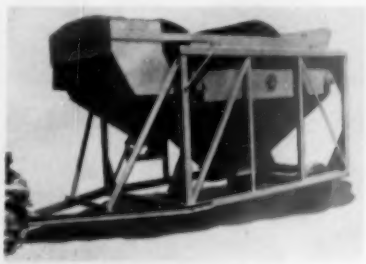


Liquid Flow Meters

NEPTUNE METER CO., 19 West 50th St., New York, N. Y., has introduced two Auto-Stop meters, a 1½- and 2-in. size, with double trip Auto-Stop valves for positive control of industrial liquids. The quantity desired is set by push buttons, and the meter shuts off the flow automatically when the exact quantity is delivered. The double trip or cushioned-stop mechanism slows down the fast moving stream an instant before it shuts off the flow, minimizing hydraulic shock or hammer, and permitting a more accurate cut-off. The valve also has wide, smooth internal passages, with a straight flow to eliminate turbulence. An Auto-Stop valve is also available with a single trip mechanism.

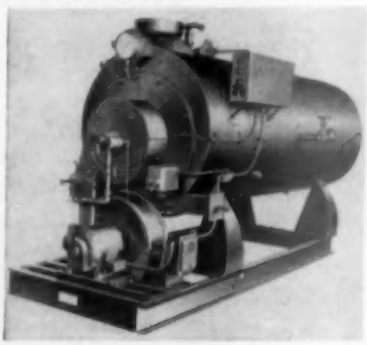
Corrugated Cut-Off Wheel

THE CORRUGATED DIAMOND SAW CO., 201 Moonachie Rd., Moonachie, N. J., has introduced a cut-off wheel with a corrugated diamond section for sawing brick, tile, concrete and stone. The design combines the features of both a continuous rim wheel and a toothed saw for faster, efficient cutting. Corrugation of the diamond section is said to provide an intermittent cutting action, increase the number of contact points, and provide a smoother flow of coolant and faster sludge release.



Portable Batching Bin

CONSTRUCTION MACHINERY SALES CO., Waterloo, Iowa, has announced the "Conveyex" concrete batching bin for use as an auxiliary portable unit to shorten haul on jobs. The unit has two, or three compartments which can be loaded with a front-end loader, and it batches each aggregate separately onto a troughing belt conveyor for charging mixers. A decumulative type scale comes back into balance as the indicated amount is discharged from each compartment.



Low Horsepower Boilers

CYCLOTHERN DIVISION NATIONAL-U. S. RADIATOR CORP., Oswego, N. Y., has incorporated a secondary air damper in the blower housing of its steam generators from 18 to 60 hp. The secondary air damper is said to be adjusted faster than the previous arrangement of adjusting blower vanes, and it is also said to provide a greater degree of accuracy in adjustment. The boilers operate at pressures from 15 to 200 p.s.i., and require no stack beyond local and state minimum requirements.

PRESTRESSED CONCRETE

(Continued from page 200)

Methods of fabrication of the Lake Pontchartrain bridge, now being built near New Orleans, La., were described by Eugene Smith, Freyssinet Co., New York. This bridge will be the largest prestressed structure in the world, the bridge and causeways being 25 miles long. It was designed by Palmer & Baker, Mobile, Ala., and construction is by the Louisiana Bridge Co., a joint venture of Brown & Root of Texas and the T. L. James Construction Co. of Louisiana. Raymond Concrete Pile Co. was consultant on pile manufacture, and the Freyssinet Co. was consultant on the pretensioning beds for manufacturing the 56-ft. slabs.

"Precast members offered the most economical means of construction of this bridge," said Mr. Smith. The design called for the entire span, 56-ft. long by 33-ft. wide, including curbs and decks, to be precast and prestressed in one unit. Piles of the cylinder type, 56-in. o.d., were precast by the centrifugal process. A circular form, with 12 rubber hoses in position for the forming of the longitudinal holes for the prestressing cables, was placed in the spinning machine. A very dry concrete mix was placed in the spinning form, and centrifugal action forced the concrete against the steel form. As spinning progressed, the form was vibrated and a roller bore down on the inside surface of the concrete to compact it.

This type of placement, according to Mr. Smith, made the concrete stiff enough so that the forms could be taken from the machine and placed on end immediately after steam curing. Each pile section received one hour of air curing, followed by four hours of steam curing. After each section was taken from the steam chamber, the form was stripped and the concrete sprayed with a curing compound. Completed sections were placed end to end, with the 12 longitudinal holes lined up. The end of each section was coated with a special joint compound to assure a strong, watertight joint between the sections. Twelve sections or two piles were lined up end to end, with a special bearing ring separating the two piles. Twelve wire cables were inserted into each of the 12 preformed holes, these running the entire pile length. Each cable was then tensioned and anchored, thus drawing the pile sections together and effecting uniform compression in the concrete.

Grout under pressure was then forced into each of the cables. After the grout set up, thus bonding in the

(Continued on page 206)

"RCA RADIO REDUCED OUR OVERTIME 20-30% PER MONTH"

(Above) Mr. Clarence Goetz, Vice-President, Clifton Concrete & Supply Co. and (below) one of the radio-equipped Clifton trucks.

—*Reports* **CLARENCE GOETZ**
Clifton Concrete & Supply Co.
Cleveland, Ohio

"It's the greatest thing that has happened to the industry since the advent of the high-dump mixer truck! RCA Radio has reduced our overtime anywhere from 20 to 30 per cent per month. We've made extra profits by being able to close our plant earlier at night."

And he continues:

★ Greater volume of production is possible. Ten trucks, radio-equipped, are equal to 11 trucks.

★ Efficiency in dispatching trucks makes entire operation more efficient. Drivers are supervised at all times, reducing unnecessary trips and delays.

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★ RCA 2-Way Radio assures much better service. It not only makes money for us—it makes money for our customers.

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Radio Corporation of America, Communications Products, Dept. B-206, Bldg. 15-1, Camden, N. J. In Canada: RCA VICTOR Company Limited, Montreal.

☐ Please send me complete information on the use of 2-Way Radio in my business.

☐ Have RCA Communications Specialist make a free RADIO SURVEY of my business.

NAME_____

ADDRESS_____

CITY_____ STATE_____

PRESTRESSED CONCRETE

(Continued from page 204)

12 wires, the anchorages were cut off and the cables, where they connected, were burned off. The cables, through bond in the grout, continued to transmit the prestressing force to the pile.

Pile caps were all cast upside down, Mr. Smith said. Spirals projected from the top of the castings for insertion into the piles themselves. The concrete for these plugs was the only cast-in-place concrete on the job.

To make the bridge slabs, three pretensioning beds, each with eight sets of forms, were set up, the speaker said. Each bridge section had seven vertical webs, each web consisting of 25 strands of ⅜ in. wire. Since the initial stress on each strand was 12,750 lb., the total initial pretensioning force was 1115 tons, which was applied by seven jacks.

The tensioning operation consisted of drawing off 25 strands at a time from the swift car, pulling them through all eight slab forms, and anchoring them to the jack. They were then anchored to the dead end of the pretensioning bench. Repeating this operation six more times, once for each of the vertical webs, placed all strands in position for tensioning. The seven jacks were operated by one man who could tension all seven jacks at once, or in any order. With all the strands tensioned, the stirrups and the mild reinforcing steel were placed and the concrete poured. After steam curing, which was used to accelerate concrete strengths, the strand stress was released, and the strands cut flush with the concrete face.

Slabs and pile caps were carried by a stiffleg gantry to barges. A 200-ton gantry was required because the slab sections weighed 180 tons. The yard arrangement established for the making of piles, caps and slabs and the water operations for driving and setting have already produced as many as 56 pile bents and slabs in a week, or 0.6 miles of completed bridge deck per week.

Mr. Smith also described earlier projects undertaken by his company, such as a high school at Greensboro, N. C., and Pier C at Hoboken, N. J. He said that these jobs, as well as the Lake Pontchartrain bridge, had been economical on a competitive bid basis.

C. C. Zollman, Springfield, Penn., one of the pioneers in the development of prestressed concrete in this country, showed slides of many of the prestressed structures of Europe, and explained their design features.

Predicting a bright future for pre-

(Continued on page 208)

"... the best move we ever made!"

Harry Wellnitz Company
MANUFACTURER OF TRU-BLOK
CONCRETE CINDER LITE-STONE

TELEPHONE JO. 2112
OFFICE AND PLANT 321 N. PRINCETON AVE. COLUMBUS 23, OHIO

Mr. William Merkel, Sales Manager
American Clay Machinery Division
Huber-Warco Company

Dear Mr. Merkel:

It seems that nine out of ten times we write to an equipment manufacturer only to complain or find fault. Now, much to the contrary, we are pleased to write you about the wonderful performance of our No. 9 Cinder Grinder, manufactured by your firm.

Frankly, I think putting the No. 9 in our plant was the best move we ever made. We use the material as it comes from the grinder -- it doesn't need screening. For over ten years the machine has ground an average of 20,000 tons of cinders a year and its dependability has been remarkable. And the few times we needed service, it was fast and efficient.

I sincerely recommend the American No. 9 grinder -- it has certainly performed for us.

Yours very truly,
HARRY WELLNITZ COMPANY
Harry Wellnitz
Harry Wellnitz, President

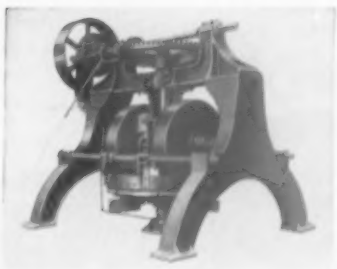
Harry Wellnitz
President

For grinding cinders, haydite, pumice, slag, and quarry and mine products, American offers a complete line of grinders in eight sizes to meet all varying plant requirements. Their capacities range from 15 to 80 tons per hour.

If accurate grinding, in volume, poses a problem in your plant . . . ask for a non-obligating consultation with the "American Specialist" to take advantage of the years of experience he can offer you . . . write, wire or phone.

American No. 9 Grinder

This 30-yard capacity grinder has been designed to give big-volume aggregate production with a minimum of grinding costs. Mullers are adjustable to any height, and for finer grinding, the grinding surfaces run together.



American CLAY MACHINERY

A Division of HUBER-WARCO Company
Marion, Ohio, U. S. A.

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CLAY MACHINERY • GRINDERS • ROAD ROLLERS • MOTOR GRADERS • MAINTAINERS

PRESTRESSED CONCRETE

(Continued from page 206)

stressed concrete, Ross Bryan, Nashville, Tenn., consulting engineer, declared that it lends itself particularly to composite construction, but it must look like monolithic concrete. He said that the fabricating plant is the place where the work should be done, although many contractors want to do it on the job.

Prestressing Wire Tests

W. O. Everling, director of research, American Steel & Wire Division, U. S. Steel Co., Cleveland, said that tests of prestressing wires have gone far above the normal range of current usage and that wire manufacturers do not know how high the stresses might go without harming the steel. He pointed out that nitrates and hydrogen sulphite in soils and air have accounted for stress corrosion failures. He concluded by giving his company's recommendations regarding types of wire to be used for prestressing and post-tensioning. These include the use of:

1. Oil-tempered wire in prestressed concrete,
2. Cold-drawn, high tensile, stress relieved wire for post-tensioning work of linear structures,
3. High tensile wire in the as-drawn state, without final stress relieving, for circular structures, such as prestressed pipe,
4. Relatively small diameter stress relieved high tensile, seven-wire strand made from cold drawn wire, for pretensioning work, and
5. Large diameter strand made from cold drawn wire for post-tensioning work in which individual stressing members of great strength are advisable. If the strand is to be left ungrouted, such wire should be hot galvanized, and if grouted, it should be bright wire, non-stress relieved. Stress relieving before forming into strand is impractical because the necessary cold deformation to make the strand destroys the mechanical properties produced in the stress relieving treatment, he added.

The past four years have seen the solution of many of the problems of prestressed concrete construction, according to W. E. Dean, engineer of bridges, Florida State Road Department, concluding speaker. He said that many construction firms in the past two years have become equipped to make prestressed concrete and that many prestressing plants had been established. The rapid development in the past few years, he added, will be greatly increased if those in the academic field, engineers, architects, tech-

Only a WESTINGHOUSE has...

all these important performance features

Ready Mix operators agree. They want mixers that load fast . . . mix fast . . . discharge fast . . . at low operating and maintenance costs. That's exactly what Westinghouse Transit Mixers give you—and more!

A time-tested and proven mixer, with a new name and several new features, the new Westinghouse is available in five sizes, 4½ to 6½ cubic yards. You pick the size best suited to your operation and watch the Westinghouse go to work. Short, medium, long . . . whatever the length of haul, you are ready to pour . . . and fast . . . when you get there.

Double-action mixing

Exclusively Westinghouse is the 6 auxiliary reverse mixing blade drum feature which assures faster, better and more uniform mix in less than minimum turns specified on the rating plate.

Fully enclosed gear drive

Only Westinghouse Transit Mixers have a fully enclosed gear drive for the drum . . . important because there are no exposed gears or chains to wear out, break and cause trouble. Maintenance expense is drastically reduced.

Self-aligning drum mounting

There can't be any misalignment wear and tear with the Westinghouse exclusive ball-and-socket front end mounting AT THE DRUM because it doesn't transmit truck and mixer frame flexing to driving parts.

Other plus features

2-speed transmission permitting wide range of rotating speeds at efficient engine speeds—and mixer engine mounted at front of drum away from harmful dust, bumps and excess vibration.

TRANSIT WESTINGHOUSE MIXER

See WESTINGHOUSE Transit Mixers at the NRMCA show at the Coliseum in Chicago, Feb. 13-16th.

CLIP AND MAIL COUPON TODAY . . .

Westinghouse Transit Mixer Division,
LeTourneau-Westinghouse Co., Indianapolis, Indiana
Please send free illustrated booklet on the new Westinghouse Transit Mixer.

Name.....
(PLEASE PRINT)
Company.....
Address.....
City..... Zone..... State.....

CP-562

nical societies and business men work together. He said that for many applications, prestressed concrete can be expected to do a better job than other forms of construction.

Some of those attending the conference stayed over to inspect the fabricating plant of the Florida Prestressed Concrete Co. in Tampa, one of the largest in the state. It is operated by the Cone Brothers Contracting Co.

Builds Ready-Mix Plant

RICHTER CONCRETE CORP., Cincinnati, Ohio, is building its tenth ready-mixed concrete plant in the area, which is expected to be completed by April, 1956. The plant is being built on a 16-acre site and is expected to cost approximately $175,000. It will have a production of about 150 cu. yd. per hour, bringing daily production to about 3000 cu. yd.

Carolina's Association

THE NORTH CAROLINA READY MIXED CONCRETE ASSOCIATION changed its name to Carolinas' Ready Mixed Concrete Association. The office will remain in Raleigh, N. C., with H. J. Stockard, Jr. as executive secretary. H. O. Null of Goldsboro, N. C., was elected president. The Spring meeting will be held at Myrtle Beach, S. C.

Masonry Design Manual

CONCRETE MASONRY ASSOCIATION, Los Angeles, Calif., has published a new 130-page "Concrete Masonry Design Manual," which represents a valuable reference for architects and engineers who design concrete masonry structures, for code writing and enforcement agencies, and for plan checkers. The manual is divided into nine sections, each with its own foreward; it contains a wealth of detailed drawings to scale, standard details of assembly and construction, and engineering tables for design computations. The publication is designed so that the pages may be easily removed for tracing and re-inserted in the loose-leaf binding; and new pages, which will be published from time to time to supply additional data, be added.

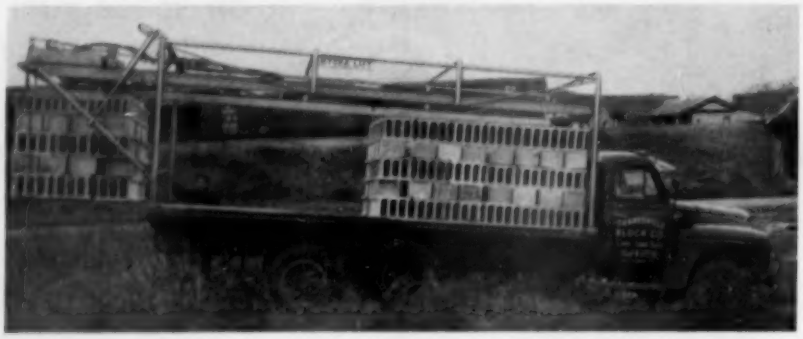
Individual sections cover the following subjects: basic concrete masonry units, typical assembly and layout, door and window details, construction details, residential design, architectural patterns, specifications, design tables and charts, and engineering design.

The manual can be obtained from Concrete Masonry Association, 3250 W. Sixth St., Los Angeles 5, Calif. Price is $5.00. (Subscriptions are complimentary when placed through a C.M.A. member).

HYDRA-LIFT UNLOADER

(Patents Pending)

CRANESVILLE BLOCK COMPANY



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COSTS DROP! PROFITS JUMP!

—when HYDRA-LIFT unloads your blocks. That's why the Cranesville Block Company is already considering the purchase of their *2nd* HYDRA-LIFT.

Another HYDRA-LIFT user, *Mr. S. W. Williamson*, President of *Samson Block and Supply Co., Inc., Media, Penna.*, says: "We wish to comment favorably on our experience with the two Hydra-Lifts we have been operating for more than a year. They have been relatively trouble free and on occasions we did need service we found your organization cooperative and efficient."

Other block plants are realizing HYDRA-LIFT savings—some as much as $30.00 per working day with one unit alone. WHY NOT YOURS?

UNLOAD TWO CUBES AT A TIME **UNLOAD WITH EASE ON HILLS** **UNLOAD INTO BASEMENTS**

CHECK THE WEIGHT!

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Dealer Inquiries Invited

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Mfrs. of BLOCK UNLOADERS for over TWO YEARS

For 50 Years

Dunn Machines Have Paced the Drain Tile Industry

They have pioneered in the production of high quality tile—strong, dense, and truly round. They have influenced the greater use of concrete tile by lowered prices and easier availability. They have encouraged its manufacturing as a community enterprise.

Efficient, compact, low-investment Champion plants, using local aggregates and local labor, pare production costs to the minimum. Effect tremendous economies in freight, distribution and breakage. Net results: lower costs to consumers, leading to increased sales volumes, and a generous margin of income for the manufacturer.

Investigate — today — the most profitable angle of the concrete products industry. Write for a copy of the Champion catalog.

W. E. DUNN MFG. CO.

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SAVE FUEL • REDUCE CURING TIME

CUT COSTS • UP PROFITS

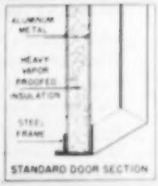
with *Standard* KILN DOORS!

WHERE AISLE SPACE IS LIMITED STANDARD sliding doors need no aisle space. The carrier-type door (shown) requires 15" minimum clearance above top of door opening. A vertical sliding door, counterweighted for easy opening, is also available.

WHERE HINGE-TYPE DOORS ARE PREFERRED Choose from two STANDARD hinge-type doors. The top-hinging door (shown) can be used when there's insufficient room at sides of door. The conventional side-hinging door has rugged hinges and positive-seal lock.

CHECK THESE FEATURES

- Heavy Aluminum Sheets on Both Sides of Thick Vapor Proofed Insulation.
- Rugged Steel Frame.



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ALSO SEE WHERE TO BUY ADVERTISING ON OTHER EQUIPMENT IN ROCK PRODUCTS' GENERAL SECTION

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Three (2) Concrete Truck Mixers all in good condition
1—3½ yd. Ransome G.M.C. 1950
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1—5½ yd. Ransome Autocar 1950
Priced to sell

DE LUKE SAND & GRAVEL CO., INC.

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FOR SALE

No. 7 Joltcrete Block Machine complete with motor, etc. 4", 6", 8" and 12" molds. Offbearer. Turntable. Pallets. Reason for selling, installing larger equipment.

COSHOCTON BUILDERS SUPPLY

Locust at Water St. Coshocton, Ohio

PRICED FOR QUICK SALE

GO CORP JUNIOR TWIN block machine complete with power carriage; agitator; offbearer; compressor. 4", 8", 12", and chimney block attachments. 3200—8"; 2000—4"; 600—12"; pressed steel pallets. 500 cast chimney block pallets. Everything modular.

STEARNS MODEL A CLIPPER with attachments to make 5x8x12" building tile; 5x4x12" partition tile; 5x8x10" building tile; 5x8x10" corner tile; 4600—5x8x12" pallets; 3000— 5x8x12" sash pallets; 4000—5x8x10" pallets; 2000—5x8x10" return corner pallets; 7000—5x4x12" pallets. All pallets cast. Everything modular.

ANY OF ABOVE MAY BE PURCHASED SEPARATELY.
Your mid-west GO CORP dealer
OLSEN SALES CO., Rock Rapids, Iowa

SWAP — SELL — BUY

BLOCK MACHINES

Stearns #7 & 9 Joltcretes	$500.00 each
(Joltcrete owners at this price buy one for spare parts.)	
Mold Boxes #7 & 9	150.00 each
2—Stearns Clipper Strippers	250.00 each
1—Monroe 28 Cu. ft. Concrete Mixer	995.00
1—George 28 Cu. ft. Concrete Mixer	750.00
1—Continuous Mixer	150.00
2—Air Offbearers Stearns #7 & 9	250.00 each
1—Truckman Lift Truck (excellent condition)	500.00
2—Hand Lift Trucks	175.00 each
1—40 Cu. ft. Stearns Skip Loader	1000.00
100—Racks for cored steel pallets	10.00 each
100,000 pressed steel pallets in stock	

(Send tracing or sample for quotation).

WRITE • WIRE • PHONE
Mr. Flowers

Send in list of equipment you need. If we don't have it in stock, we usually know where we can find it at a bargain.

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LOWER COST

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Proved to last as long or longer — yet cost considerably less. Write for prices.

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Complete Brikcrete Plant, priced very reasonable.

Reason for selling owner has other business interests.

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SPECIALS

Short Conveyors 14" to 24" built to order.
New & Used Bin Gates, Simplex & Duplex.
Small Jaw Crushers for Broken Block.
Universal Vibrating Screens in stock.
2—Bonded Cinder Roll Crushers.

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1—F. C. George Block Machine with 8x8x16; 4x8x16; 10x8x16; Attachments & Pallets.
1—McCracken Drain Tile Machine 5" to 16".
1—Small Drain Tile Machine 5" to 12".

This equipment in working condition. Replaced by larger equipment. Contact

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PACKERHEAD PIPE MACHINE

Makes sizes 6" to 36" diameters in 3' or 4' lengths. One year old and used very little. Write to:

BOX O-17, CONCRETE PRODUCTS
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#9 JOLT CRETE—2 AT A TIME

4000 8" Equiv. A DAY Excellent condition. 5" & 12" attachments with approx. 4800 8" & 2700 12" pallets. Approx. 100 Chase block cars, trans-fer cars, rail and turntable. Many spare parts for machine included. ALSO a complete drag line with 75 H.P. motor.

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USED COLUMBIA MACHINES

Reconditioned Model #8	$6,000.00
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All Prices Quoted F.O.B.

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BUSINESS OPPORTUNITY

We have unlimited shale right in the market. Trade area of a million people. Fastest growing country in Missouri. Labor conditions and demand for light aggregate good. Would lease on tonnage basis with reasonable guarantee. Write:

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Distributor or manufacturer's representative to handle complete line of concrete products machinery, protected territories, generous commission.

BOX O-4, CONCRETE PRODUCTS
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BOX O-9, CONCRETE PRODUCTS
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Mid-Western Concrete Equipment Co.
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CEMENT COLORS
MORTAR COLORS

made by

BLUE RIDGE TALC CO., INC.
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Hetzel Ready Mix Concrete Plant 750 bbls Cement bin complete with screw, elevator and weight batcher. 45 Ton 3 compartment aggregate bin with weigh batcher.

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1951—20 H.P. Eclipse Super-Scotch Steam Boiler used 4 years combination natural gas or #1, 2 or 3 fuel-oil. Pressuretrol set at 95 lbs. 1½" top outlet pop valve set at 100 lbs. 110 volt, 1 P.H., 60 cycle current boiler. Cork insulated. Also condensate unit.

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WITH
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FOR SALE

1—#9 Riddell Dry Pan Cinder Grinder.
Capacity 30 tons per hour.

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FOR SALE

Joltcrete #9, complete with new batch mixer and skip loader, power offbearer, pallets, turntable, racks, Truckman rack mover, and Hyster lift truck. All equipment is in excellent running condition.

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WANTED

Used Concrete pipe equipment, bend and tile machine, three compartment batch bin about 21 ton, low type preferred.

ASSOCIATE CONTRACTORS
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unbreakable

PALLET RINGS

Write for full information

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INDEX TO ADVERTISERS IN THE CONCRETE PRODUCTS SECTION OF ROCK PRODUCTS

SEE INDEX OF ROCK PRODUCTS SECTION ADVERTISERS ON PAGES 231, 232

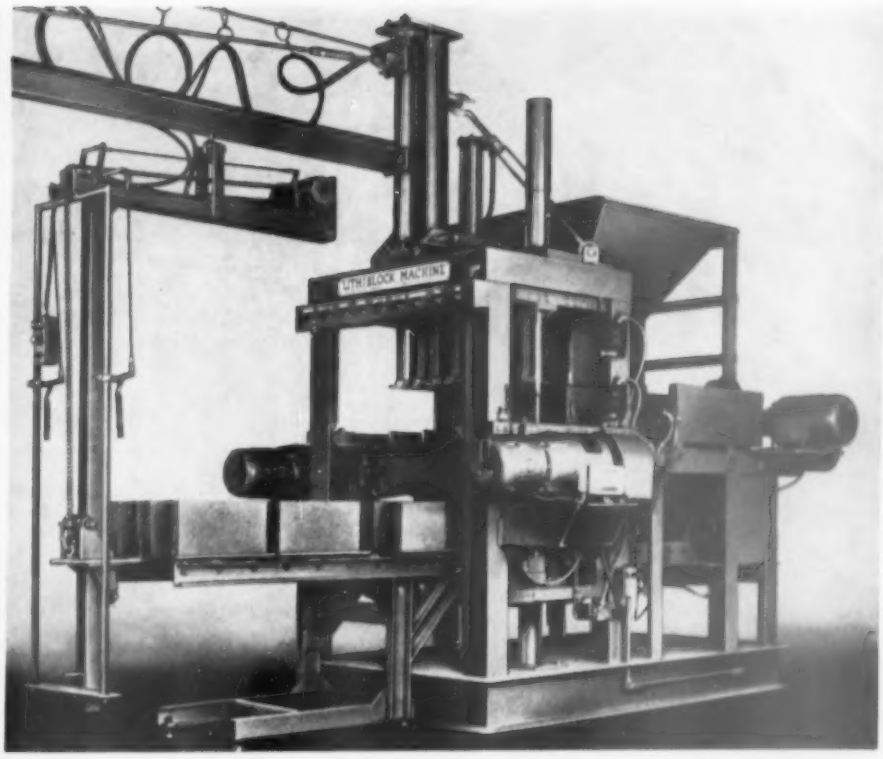
The hydraulic power package used with the new Lith-I-Block Machine has 12.5% more power than used with other block machines. This means greater speed and more units per day.

Improved feed drawer with Rota-Posed agitation. Fills mold box in ⅓ the former required time. No shakers needed.

Micro-justable vibration gives you the most-compacted building units produced — and volume up to 50% more than ever before.

The NEW Lith-I-Block Machine is heavier and bigger.

Redesigned air-operated Lith-I-Block Machine has increased output — up to 50% greater capacity.



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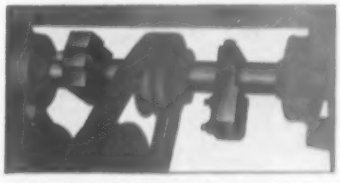
LITH-I-BLOCK "Greater Production Machines"

NOW...HYDRAULICALLY or AIR POWERED

ROTA-POSED AGITATION — provided by three heavy-duty rotating shafts with interlocking fingers.



MICRO-JUSTABLE VIBRATION — vibrator weights are adjustable to any vibration intensity desired.

BONUS QUALITY
LITH-I-BLOCK
MADE ONLY ON THE LITH-I-BLOCK MACHINE

THE BLOCK WITH THE ***PROVEN FEATURES*** *MOST WANTED BY BLOCK PRODUCERS*

SALES AND SERVICE THE WORLD OVER

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ONE PIECE OF EQUIPMENT OR A COMPLETE PLANT LAYOUT

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Send me latest bulletins on Lith-I-Block Machine.

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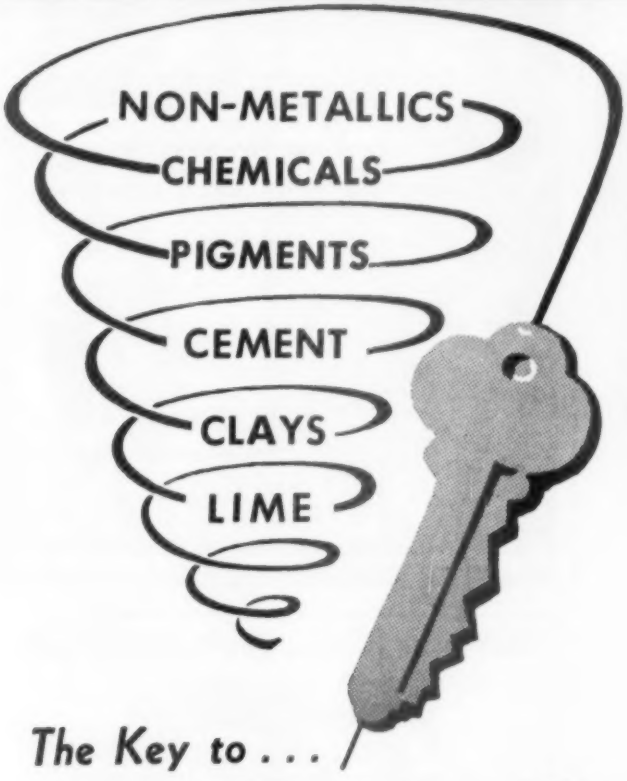

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RAYMOND Mechanical Air Separators . . . with built-in revolving Whizzer . . . give close control of the finished finenesses over a wide range, from 50-mesh to 99.9% passing 325-mesh.

They are specially adapted for classifying raw mix or cement clinker as they can produce early strength or standard grades by the outside adjustment of the vertical slide dampers. They are equally efficient in making uniform grades of agstone, limestone sand, gypsum and various fillers.

Super Separator units are available for classifying sub-sieve materials in the lower micron sizes. Also for dedusting operations, as in the removal of fine dust from sea coal, soda ash and similar products.

Whizzer separation insures cleaner, faster and more uniform classification with greatly increased output. If you have a special problem, Raymond engineers can help you in setting up economical production methods.

Built in sizes from 4'0" to 18'0" diameter with Single Whizzer, or Double Whizzer, (as shown). Also a 30" Air Separator, and a Laboratory 10" Separator.

For further details, see Bulletin No. 76

COMBUSTION ENGINEERING, INC.

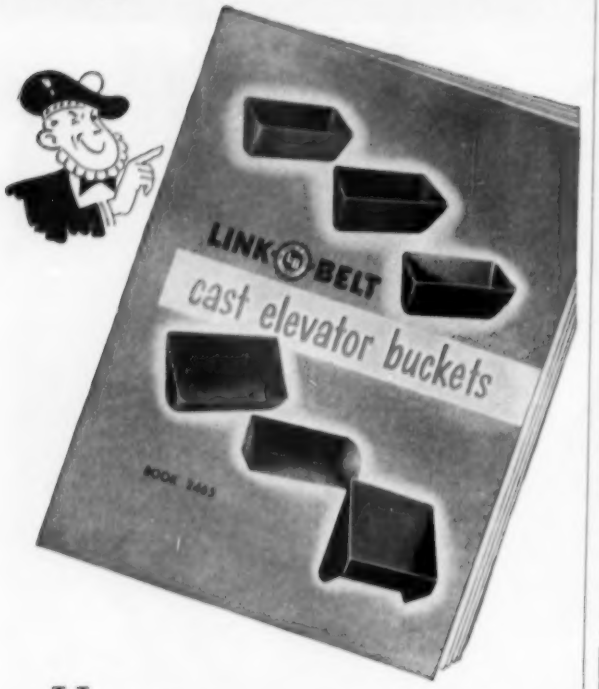
Raymond Division

1307 North Branch St.
Chicago 22, Illinois

SALES OFFICES IN PRINCIPAL CITIES

Combustion Engineering-Superheater, Ltd. • Montreal, Canada

Here's complete data on cast buckets for tough elevator service



HERE'S why Link-Belt cast elevator buckets offer longer life, better handling. Special casting techniques assure uniform sections and smooth surfaces. Reinforced corners, lips, ends and backs provide maximum rigidity.

All six styles pictured above are readily available in malleable iron or Promal for mounting on either belt or chain. Aluminum and bronze can be furnished for special applications. Book 2465 gives complete ordering information, including sizes carried in stock. Ask your nearby Link-Belt office or distributor for a copy, or return the coupon below.

13.982

LINK-BELT

CAST ELEVATOR BUCKETS

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Please send me a copy of Book 2465, "Link-Belt Cast Elevator Buckets."

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SPRAY NOZZLES

performance-proved for every operation

Improve the quality of spraying operations by exact control of spray pattern and impact in washing . . . and by more accurate distribution of spray in wetting-down operations. Patented designs plus the widest choice of types and capacities in the industry, permit exact selection to to fit your needs.

write for catalog 24

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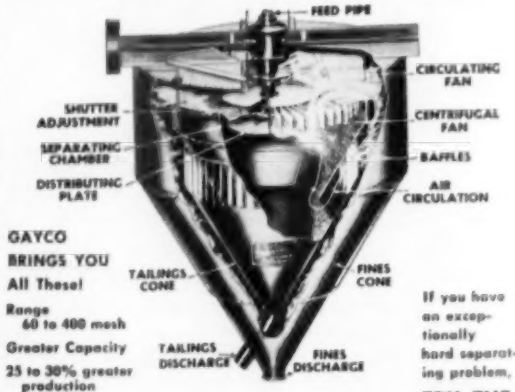
3285 Randolph Street • Bellwood, Illinois

GAYCO CENTRIFUGAL SEPARATORS



GAYCO BRINGS YOU All These!

- Range 60 to 400 mesh
- Greater Capacity
- 25 to 30% greater production
- Cleaner Tailings
- Uniform Products
- Slow speed for slow wear
- Quick and easy adjustments

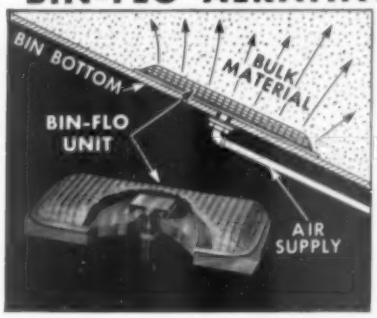
"TIMKEN BEARING EQUIPPED"

If you have an exceptionally hard separating problem, **TRY THE GAYCO.**

Closer separations are possible with the Exclusive Gayco Centrifugal sizing fan. Higher production results from a more complete removal of the fines made by the mill. The efficient Gayco sizing eliminates all undesirable oversize from the product.

UNIVERSAL ROAD MACHINERY CO.
Robert M. Gay-Division
Factory and Laboratory, Kingston, N. Y.
117 LIBERTY STREET NEW YORK 6, N. Y.
Canadian Representative: Watson Jack—Hopkins Limited
8500 Decarie Blvd., Montreal, Que.

BIN-FLO AERATING UNIT



Provides Steady Flow of Dry, Finely Ground Materials which tend to bridge in storage. Uses only small amount low-pressure air.

BIN-DICATOR BIN LEVEL INDICATOR

For All Bulk Materials

signals change in level; automatically starts and stops filling and emptying equipment.

THE BIN-DICATOR CO.
13946-F Kercheval • Detroit 15, Mich.

NEW DETAIL DATA BOOK FREE

CUT TIME AND LABOR COSTS

on "secondary breakage"

with FREDERICK CAST semi-steel DROP BALLS

Eliminate costly, time-consuming drilling or blasting with this low-cost production tool. Rugged, durable Frederick Drop Balls provide you with quick, easy crushing power where you want it—when you want it, with little or no maintenance. Frederick's exclusive "pear-shaped" design withstands greater impact and gives straighter "pin-point" drops. Exclusive "E-Z Swing" steel eye is recessed to prevent excessive ball movement and keep hook in place. Nickel alloy is standard on balls 4000 lbs. or over—or, we'll be glad to quote on special alloys if desired.

Balls can be furnished with replaceable pins, if requested. Special release hooks for free dropping are also available.

Write us today for prices and illustrated literature. Order Balls direct or from your Equipment Dealer.

	Wide Range of Sizes and Weights:						
Pear shape (lbs.).....	1300	2000	3300	4000	5200	6500	8000
Ball shape (lbs.).....	500	1000	2000	5200			
Spherical shape (lbs.)..... (for magnet use)	470	950	1650	2400	3000	3700	5400

FREDERICK IRON & STEEL, INC.
FREDERICK *Established 1890* MARYLAND
Phone: MOnument 3-5111

CENTRIFUGAL PUMPS • MUNICIPAL AND GRAY IRON CASTINGS

The adjustable-speed wedgbelt drive is a Combination...

. . . of American Adjustable-Diameter Sheaves, allowing stepless speed variation by internal change of pitch diameter. Exclusive *double-taper* hub locks flanges in position, locks sheave to shaft. Positive speed control is assured for crushing, vibrating, grinding and other processing operations.

. . . of American Wedg-Tite Bushings with exclusive *steeper taper* for fast installation and easy removal, uniform compression, positive alignment, and maximum clamping action on the shaft.

. . . of American Wedgbelts, mold-cured to vary less than ¼ of 1% in length, with strict uniformity in taper, thickness and width. Dacron* cords in Super-Service Wedgbelts are 2½ times stronger than rayon, withstand shock loads and high starting torques.

. . . of AmericanWedg-Tite Companion Sheaves, precision-matched to the same taper of the bushing, the exact sidewall angle of the belt. Machined to a satin finish, with accurate balance and concentricity, they lower frictional power-loss, increase efficiency.

THE RIGHT COMBINATION FOR MAXIMUM VARIATION OF MACHINE SPEEDS

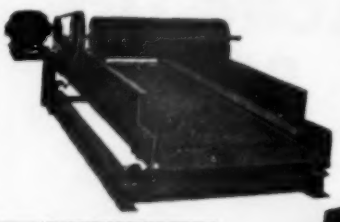
*Reg. TM. E. I. DuPont de Nemours & Co., Inc.

The American Pulley Company
4212 Wissahickon Avenue
Philadelphia 29, Pa.

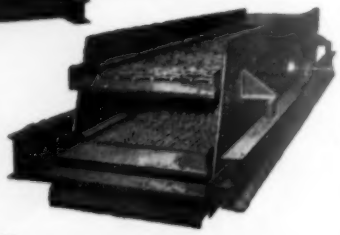
BONDED

equipment is superior for

- CRUSHING . . .
- SCREENING
- CONVEYING . . .



BONDED® General and Heavy Duty Vibrating Screens



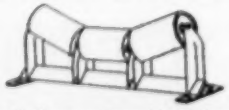
Size	Decks	Price
General Duty Models		
2′ x 4′	1	$ 355.00
3′ x 6′	1	495.00
3′ x 8′	1	575.00
Heavy Duty Models		
3′ x 8′	2	1165.00
3′ x 8′	3	1250.00
4′ x 8′	2	1695.00
4′ x 10′	3	2095.00
4′ x 12′	3	2395.00

Write for bulletins 1086 and 1087

Best for all minerals, chemicals, foods or industrial products. Improves sizing, grading and cleaning or separates solids from liquids. Screening areas range from 2′ x 4′ to 5′ x 14′, and with 1 to 5 decks giving 2 to 6 accurate separations. Bonded screens perform with maximum efficiency whether for heavy scalping of high tonnages, large capacities for multiple sizing, dedusting or dewatering. Economical operation and low maintenance. Models from $355.00.

BONDED CARRIES LARGE STOCKS OF SCREEN CLOTH FOR IMMEDIATE SHIPMENT

BONDED® BALL BEARING TROUGHING IDLERS and RETURN ROLLS



Rolls are 5" diameter steel tubing with quality ball bearings. They are balanced for easy starting in cold weather. Shafts are ⅜" in diameter, and run completely through each roll. Furnished with easily replaceable pre-lubricated Sealed ball bearings. Also can be furnished with greasable type Alemite Fitted bearings. Maintenance is negligible.

3-roll, 5" diameter Troughing Idlers for:				
14" belt	$17.25	24" belt	$19.75
16" belt	18.00	30" belt	20.50
18" belt	19.00	36" belt	21.25
20" belt	19.25	48" belt	23.75
1-roll, 5" diameter Return Rolls for:			
14" belt	$ 6.75	24" belt	$ 8.00
16" belt	7.00	30" belt	8.75
18" belt	7.50	36" belt	9.25
20" belt	7.75	48" belt	10.75

BONDED® TROUGHING IDLER CONVEYORS

Ideal for either surface or underground operation, and can be supplied in any length or belt width desired. Bonded furnishes complete conveyors or Ready-Fab prefabricated sections, full range of idlers, belting or accessories to make your own conveyor. Conveyors are equipped with 5" roll diameter idlers and return rolls, 20" diameter head pulley and 16" diameter tail pulley mounted on 2¼" or 2-7/16" diameter shaft. Belt is new 4-ply, 28 oz. duck, ⅛" top rubber cover x 1/32" bottom rubber cover. Ready-Fab sections are quickly assembled on the job.

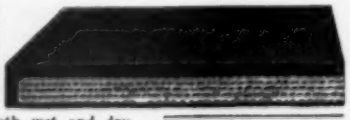
Belt Width	Conv. Lgth.	Price	Conv. Lgth.	Price
14"	25′	$ 672.00	50′	$1064.00
16"	20′	592.00	45′	1012.00
18"	30′	825.00	55′	1257.00
18"	85′	1798.00	100′	2065.00
20"	35′	960.00	60′	1429.00
24"	40′	1139.00	70′	1744.00
24"	100′	3339.00	130′	2995.00
30"	45′	1375.00	90′	2432.00

For conveyors shorter or longer than those listed above, add or deduct the following per foot prices according to belt width. Prices include belting.

For 14" belt $15.66 per ft.
For 16" belt $16.78 per ft.
For 18" belt $17.20 per ft.
For 20" belt $18.95 per ft.
For 24" belt $20.26 per ft.
For 30" belt $23.02 per ft.

Complete details in Bulletin # 1138. Write for it.

BONDED RUBBER CONVEYOR BELTING



A fine grade of belting for troughing or picking idler conveyors and bucket elevators. Used in mines and quarries. For coal, crushed stone, sand, gravel, earth, clay products, chemicals and other bulk materials both wet and dry. Heavy duty 4-ply, 28 oz. duck, ⅛" top rubber cover x 1/32" bottom rubber cover belting, having high tensile strength, tough cotton duck, strong carcass and proper flexibility. Also available with varying thicknesses of top and bottom covers in from 4 to 8 plies, and widths to 60". BONDED'S low belting prices save you up to 25%. Write for free sample.

Width	List Price	Sale Price
14"	$3.43 ft.	$2.75 ft.
16"	3.86 ft.	2.88 ft.
18"	4.27 ft.	3.19 ft.
20"	4.69 ft.	3.69 ft.
24"	5.55 ft.	4.14 ft.
30"	6.77 ft.	5.06 ft.
36"	8.01 ft.	6.00 ft.

BONDED® HEAVY DUTY FLIGHT CONVEYORS

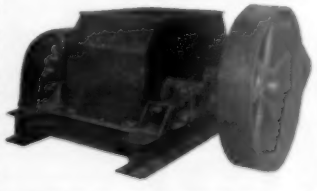
These rugged conveyors are built to move gravel, cinders, slag, broken rock, coal, wood products and other bulk materials at angles up to 45 degrees. They are fast, efficient and economical. Made of welded structural and sheet steel with heavy duty double guided chain, in portable and stationary models. Flight sizes up to 8" x 24". Any length. Priced from $421.00.

BONDED® RECIPROCATING PLATE FEEDERS

Bonded heavy duty feeders are economical and efficient for controlling feed to crushers, screens, conveyors, mills and other processing machinery. Excellent for handling high tonnage of coal, sand, gravel, metallic ores, crushed stone, aggregate and almost any other bulk material. Sizes for every need. Capacities to 225 tons per hour. Priced from $280.00.

BONDED® CINDER, STONE, PUMICE, PERLITE CRUSHERS

Bonded double roll crushers for accurate, high capacity sizing of lightweight aggregate, pumice, perlite, phosphate rock, chemicals, limestone chips, fertilizers, some stone and many more natural and manufactured products. Available with Smooth, Fine or Coarse Corrugated rolls or any combination of same. Also made with Tooth Rolls. Capacities to 500 tons per hour. Write for new eight page Bulletin 1119. Priced from $479.00.



IMMEDIATE SHIPMENT FROM OUR FACTORY—WRITE, WIRE OR PHONE

BONDED Scale and Machine Company

82 KINGSTON *(Write for Free Catalog & Prices)* COLUMBUS 7, OHIO

PHONE: Hickory 4-2186 DAYS — PHONE: AXminster 1-2213 EVENINGS

Mfgrs. of Conveyors, Conveyor Parts, Idlers, Vibrating Screens, Crushers, Feeders and Scales.

ALSO SEE READY-MIXED CONCRETE AND CONCRETE PRODUCTS EQUIPMENT WHERE TO BUY ADVERTISING IN CONCRETE PRODUCTS SECTION

KILNS—DRYERS—COOLERS

1—8' x 125', ¾" shell.
4—7' x 110', 9/16" shell.
1—7'6" x 7' x 125', ½" shell.
2—6' x 74', ⅜" shell.
2—7'5"x20', 5'2"x20' Link Belt, Rote-Louvre
1—6' x 40', ⅜" shell.
1—6' x 60', 5/16" shell.
1—5' x 40', ⅜" shell.
1—5' x 30', ⅜" shell.
1—4'6" x 50', ⅜" shell.

CRUSHERS—PULVERIZERS—MILLS

2—Allis Chalmers 10" Superior McCully.
1—Allis Chalmers k-9 Gates Gyratory.
10—Jaw Crushers 5"x6" to 42"x48".
2—Pennsylvania #5XR-100, 100 TPH.
3—Hardinge 4½' x 16", 6' x 22", 7' x 36" Ball Mills.
3—Patterson 6'x8' Ball Mills.
1—Raymond #40 Imp.
1—Williams #20 H.O. Slugger Hammermill.
2—A.C. 6'x22' Tube Mills, 300 HP motors.
1—Allis Chalmers #8722 Compeb Mill.

SCREENS—SEPARATORS

1—Tyler Hummer Screen 4'x7'.
1—Link Belt 3'x8' double deck screen.
5—Rotex 40"x84", 40"x120".
4—Air Separators 6', 8', 10', 14'.

MISCELLANEOUS

2—Chicago 14"x7" Compressors, 434 sfm.
2—Oliver Rotary Dewaterers 8'x4'.
12—Bucket Elevators 20' to 75' centers.
250 ft. Link Belt 12" Troughing Conveyor.
1—10,500 gpm Centrifugal Pump 135' head.

Partial List
Your Inquiries Solicited

BRILL EQUIPMENT COMPANY

2401 Third Ave. New York 51, N.Y.
or
4101 San Jacinto St. Houston 4, Texas

LOCOMOTIVES: 2—ALCO 125 ton, 1000 H.P. McIntosh Seymour diesel with G.E. electric equipment. Sale or rent.

DRAG SCRAPER: Ingersoll Rand 50 H.P., 3 drum 220/440 volt. Also, one 2 drum, 15 H.P.

SHOVELS & CRANES: Manitowoc 4500, 3900 and 3500. P&H 855, 2 yd. capacity shovel front and 90 ft. dragline boom. G.M. 671 diesel motor. Lorain 620 Dragline with 90 ft. boom, D13000 Caterpillar diesel. Lorain model TL30 with backhoe and crane boom. Bucyrus Erie 130-B electric, 4 yd. capacity, 3200 volt, A.C. Shovel Front for Bucyrus Erie 54-B, 2½ yd. NEW condition.

LOCOMOTIVE CRANE: 25 ton capacity, standard gauge, gasoline powered, cast steel trucks, air brakes with or without 1¼ yd. Williams clam shell bucket, thoroughly modern, excellent condition. Located Minnesota. For sale or rent.

CARS: 10—Easton 10 ton capacity, standard gauge, side dump.

PUMPS: 10" Centrifugal, capacity 5500 GPM @ 280 ft. head, 500 H.P. Also, one 3000 GPM, 280 ft. head, 300 H.P. Both 2200 volt.

PAN FEEDER: Heavy duty manganese 60" x 14' ft. with 20 H.P. motor, speed reducer and drive. NEW condition.

DRYER: 5 ft. x 30 ft. complete with all auxiliary equipment.

TUBE MILLS: Allis Chalmers 5 ft. x 22 ft. with steel heads.

REDUCTION CRUSHERS: Allis Chalmers R548 Hydrocone, with large stock of new parts. Condition like new. Will sell parts separately. Symons 2 ft. Cone Crusher, standard, with 25 H.P. motor and drive.

JAW CRUSHERS: Allis Chalmers 18x30" sectionalized for underground use, V-belt, 50 H.P., 220/440 volt motor, NEW condition. Also, 48 x 60", 42 x 40", 24 x 48", with or without motors and drives. Other sizes from 4 x 6" to 48 x 80".

MINE HOISTS: Single and double drum, 100 to 1500 H.P., with all electrical equipment. Complete specifications, drawings, photos available.

HOIST MOTORS:

300 H.P., 425 RPM.	600 H.P., 710 RPM.
400 H.P., 588 RPM.	1200 H.P., 444 RPM.

2200 Volt, A.C. with controls.

WE BUY AND SELL EQUIPMENT THROUGHOUT NORTH AND CENTRAL AMERICA

A. J. O'NEILL
Lansdowne, Pa.
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LOW COST—DEPENDABLE
INDUSTRIAL RUBBER PRODUCTS

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FOR ALL YOUR REQUIREMENTS OF

RUBBER HOSE

Air, Acid, Paint Spray, Solvent Welding, Pile Driver, Discharge Fire, Fuel Oil, Oil Suction & Discharge, Gasoline, Suction Water, Steam, Vacuum Pneumatic, Road Builders

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Conveyor Elevator, Grader Chute Lining, Hot Material Mucker, V-Belts Transmission

PROMPT SHIPMENTS LOW COST QUALITY PRODUCTS

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SPECIALS

2—New 6½' x 150' Kilns.
1—Complete Lime Hydrating Plant.
1—6 Williams Jumbo hammermill.
1—28" Telsmith Intercone Crusher.

KILNS

1—4' x 40', 9' x 180', Kilns.

DRYERS

1—4½' x 30', 5½' x 30', 8' x 125'.
1—30" x 20' Louisville Steam Tube Dryer.

CRUSHERS

1—36" x 42", 30" x 36", 24" x 36", 18" x 36", 12" x 24" Jaw Crushers.
2—42" x 16" Allis-Chalmers Crushing Rolls.
1—48" Telsmith Gyrasphere crusher.
36" x 16 rebuilt Sturtevant rolls.
2—24" x 14" Rogers Iron Works Crushing Rolls, Rebuilt.
1—24" x 12" Farrell Bacon Crushing Rolls.
1—6", 10", 16" and 20" McCully Superior Gyratory Crushers.
No. 3 up to No. 12 Gyratory Crushers.

BALL, ROD & TUBE MILLS

1—7'x8', 6'x12', 5½'x10, 8'x6' Ball Mills.
2—5'x16'; 1—5½'x10' Rod Mills.
2—6½'x20', 5'x22', Tube Mills.
2—6'x22' Compeb Mills—6'x22' Tube Mills.
3—3-Roll Bradley Hercules Mills, Direct Connected to 300 HP Motors.

MISCELLANEOUS

1—14' or 6' Air Separators.
1—6'x4', 12'x10' Oliver Filters.

We make new dryers and kilns.

Have you any machinery that you want to sell?

W. P. HEINEKEN, INC.
50 Broad St., N. Y. Tel. Wh. 4-4236

SPECIAL

10' x 325' ROTARY KILN, ¾" SHELL, OIL BURNERS, COMB. CHAMBER, AIR MOTOR, COMPLETE DRIVE

Kilns—Coolers—Dryers

10' x 200' x ⅝" comb. chamber.
5' x 67' x 5/16" with lifters.
5' x 40' x ⅝" with lifters.
3' x 16' x ½" brick lined, oil fired.
5' x 20' Baker Cooler.
310-12 Link-Belt Roto Louvre.
502-20 Link-Belt Roto Louvre.
1106—36 Link-Belt Roto Louvre

Elevators

52' c/c 5x5 buckets on 6" belt.
50' c/c 8x5 buckets, complete.
32' c/c 6x4 buckets on 7" belt.
26' c/c 8x6 buckets, steel case.

Pulverizers—Mills—Crushers

Hardinge 10'x48", 6' x 48"
Patterson 6' x 8' Ball Mills (3 avail.).
Raymond #1 Pulverizer.
Allis-Chalmers 6'x22' Tube Mill.

Screens—Separators

Tyler 4 x 7 with thermionic unit.
Tyler—5 x 12, 3 x 10 wet type.
Link-Belt 3 x 8 double deck.
Robinson Gyro Sifter 28A.
Gayco, 8'-5'-18" all with motor drives.

Miscellaneous

2100 CFM Sullivan Compressor WN4.
8' x 10' Oliver Rotary Filter.
8' x 12' Feinc Rotary Filter.
500,000 gal. Storage Tank.
304 HP Kewanee Firebox Boilers.
250 HP B.&W. Stirling Boilers.
150 HP Union W.T. Boilers.

HEAT & POWER CO., INC.
60 East 42nd St. New York 17, N.Y.
Murray Hill 7-5280
Machinery and Equipment Merchants

DEPENDABLE USED MACHINES

Special: Pioneer port. gravel plant with 9x36 jaw crusher, pn. tires, Int. Diesel engine.

Speeder ½ yd. dragline	Harris Power Horse; 2½ yd. bucket	Lessman loader
Lorain ¾ yd. dragline	45 ton, 3-comp., port. steel bin	40' bucket elevator
Link Belt ¾ yd. dragline	Pioneer-Meanbi 6x12 d.d. screen	Gallon grader
Schield Bantam hoe	Cedar Rapids 16x16 roll crusher	Eagle cinder crusher
A-W ½ yd. shovel	Koehring 1¼ yd. Diesel dragline	2x6 screen

These machines reconditioned in our newly-built daylight plant. Come see them.

10030 Southwest Highway TRACTOR & EQUIPMENT CO. Oak Lawn, Ill.

QUARRY EQUIPMENT

Pioneer 3042 primary crushing unit with feeder, etc. Good.
Cedarapids 3240 primary crusher. New Condition.
Cedarapids BBB 1036 jaw crusher scalping unit.
Cedarapids Model CCC 4024 Secondary roll unit.
Cedarapids 4033 hammermill secondary unit. Rebuilt.
Cedarapids 4033 hammermill. Rebuilt.
Cedarapids 2033 hammermill. Excellent.
Williams 20" x 30" Type NF hammermill pulverizer. Excellent condition.
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Cedarapids 42" x 10' apron feeder.
Cedarapids 4' x 12' double deck screen. Rebuilt.
Hewitt-Robbins 4' x 9' TD gyrex. Reconditioned.
New Holland 4-deck 4' x 12' vibrating screen.
Niagara 5' x 12' triple deck screen.
Cedarapids 3' x 8' double deck screen.
15 cu. yd. Cedarapids sand drag. New.
New 12" x 35' inclined open elevator.
60-ton, 2-comp., 8' x 18' storage bin with clam gates.
Special bins to your specifications.
Conveyors—18"—24"—30"—36". Also belting.
18" dia. x 20" face magnetic pulley.
48" Telsmith Sand Tank. New.

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Lorain 820, 2-yd. diesel shovel, crane, drag. Reconditioned.
Lima Model 84 Paymaster GN3-71 diesel.
Lorain MC-414 20-ton truck crane. Excellent.
Lima 84 Paymaster diesel shovel.
Lorain TL 20 4x2 self propelled. Excellent.
Speeder Model 60 Shovel, Hoe, Clam.
Lorain TL30, 6x4, 15-ton truck crane.
Lorain MC3, 6x4, 11-ton crane.
Unit Model 614 diesel backhoe. Good.
Unit Model 514 Gas backhoe. Good.

TRACTOR, TRUCK, SCRAPERS, ETC.

8—Euclid rear dumps, 22 ton. Good condition.
8—Cat DW10 scrapers. Good condition.
1—Cat D-7 with bulldozer blade.
1—Allis-Chalmers HD-19 crawler with Carco blade.
1—Allis-Chalmers HD-10 with Baker bulldozer.
1—Int. TD-18 with Bucyrus-Erie bulldozer blade.
1—Int. TD9 w/front shovel attachment. Reconditioned.
1—Woodridge 15-18 yd. Model TCR scraper.

DIESEL POWER UNITS

Caterpillar D7700, 63 H.P. @ 1800 RPM. Rebuilt.
Caterpillar D13000 6-cyl. diesel engine. Twin Disc clutch, extended shaft, outboard bearing, 145 H.P. @ 1000 RPM. Rebuilt.
Caterpillar D17000 8-cyl. diesel engine with Twin Disc clutch, 190 H.P. @ 1000 RPM.
GMC 6-71 diesel engine radiator to and including clutch, 150 HP @ 1600 RPM. constant duty, electric starting equipment. New condition.
GMC 12-cyl. twin diesel engine complete from radiator to and including automotive type clutch with gear reduction unit, fabricated base, electric starting system, 200 H.P. @ 1200 RPM. New Condition.

ASPHALT PLANT

Barber-Greene Model 848 with drier, graduation unit, etc.

AIR COMPRESSORS

500 Cu. ft. Gardner-Denver diesel, rebuilt.
365 Cu. ft. Gardner-Denver diesel, rebuilt.

L. B. SMITH, INC. Camp Hill, Pa.
Phone Harrisburg REgent 7-3431

FOR SALE

Bucyrus Erie 27-T Blast Hole Drill, excellent condition. Actually used 18 months. Complete with tools. Price $8,900.00.

American AC5-4 Hammermill and extra set of replaceable tip hammers. This is a large, heavy duty mill in very good condition. Feed opening 43" x 16½". Price $4,000.00.

Webster Enclosed Vertical Bucket Elevator, 65' centers. Buckets 6" x 7" x 9½" wide on heavy duty 6 ply 12" wide belt complete with 7.5 H.P. Gear Head Motor drive and backstop. Price $4,500.00.

FAYETTE LIMESTONE CO., INC.
P.O. Box 32 Washington C.H., Ohio

FOR SALE

Northwest 80D Dragline, 2½-Yd., Mur. Diesel, 70' Boom $19,500.00

2½-Yd. B/E Digging Bucket $1,250.00

Northwest 25, ⅝-Yd. Drag Cat Diesel, 40' boom, reb. 1956 $11,500.00

Northwest 20, ⅝-Yd. Drag, Gas, 35' boom $5,200.00

D7 Cat Tractor, Ser. 10928 w/DD L&T PCU & L&T Dozer, New Drivers Oct. 1955 $7,750.00

D6 Cat Tractor, Ser. 9U5139, 1¾-Yd. Trackson Hi-Lift, New Rails & Tracks Oct. 1955. $7,500.00

AC Hd14 Dozer Blade, Fair Condition $3,250.00

Barber Green Crawler Loader, Model 828-9-20, Gas Power, Extra Parts. $4,750.00

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Type 34E Rex Dual Drum Paver, GG Model, New 1944, 35' Boom, Bucket, Subgrade Template Puller, Water Measuring Tank, Aux. Tank, Gas Power $7,500.00

Type 34E Rex Single Drum Paver, GS Model, New 1947, Excellent Condition $12,000.00

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FOR SALE

CLASSIFIER—Dorr 26' bowl with 5' x 30' rakes.

HAMMERMILL—S-6 Pennsylvania 25 TPH

CRUSHER SHAFT—with bearing assembly for 1540 Good Roads Champion Jaw Crusher

G. & W. H. CORSON, INC.
Plymouth Meeting, Pa.

SCREEN FOR SALE

Seco double deck 4'x8' screen with ball tray attachment. This screen less than 2 years old—used very little and in excellent shape. Offered with drive and motor complete. At ½ off, located near Chicago. No dealers.

BOX N-94, ROCK PRODUCTS
79 W. Monroe St., Chicago 3, Ill.

FOR SALE

Marion, Model 125, Cat Electric Dragline, in good working condition, 100' Boom. Will sell as is. No reasonable offer refused.

SHERIDAN-MARQUETTE WELDING SERVICE
800 W. Marquette St. Ottawa, Ill.

TRANSIT MIXERS

Jaeger 3 Yd. Hi-Discharge, Serial No. 3HM-J5990, un-mounted, reconditioned.
Jaeger 3 Yd. Hi-Discharge, Serial No. 3HCS-J4680, mounted on Reo Tandem Truck.
Jaeger 3 Yd. Hi-Discharge, mounted Int. "K-11" 6x6, Very clean. (2).
Jaeger 3 Yd. Hi-Discharge, mounted Int. L170 Tandem.
Smith 3 Yd. Hi-Discharge, Serial No. 50237, mounted on Diamond T Tandem Axle Truck.
Smith 3 Yd. Hi-Discharge, mounted Ford Tandem.
Smith 3 Yd. Hi-Discharge, mounted Int. "L170" Tandem (2).
Rex 3 Yd. Hi-Discharge, Serial No. TD-1651, Continental power, un-mounted.

MISCELLANEOUS

Galion "116" Used Diesel Motor Grader.
Pettibone "16" Used 1-Yd. Tractor-Shovel, 4-wheel drive, torque converter.
Pettibone "15" Used 1½ Yd. Tractor-Shovel, 4-wheel drive, torque converter.
Unit Shovel Attachment complete for Unit "514".
Unit "514" Used ½ Yd. Trench Hoe or Dragline, gas power.
Barber-Greene "522" Bucket Loader, pneumatic-tired.

Note: Above equipment belongs to us.

EIGHMY EQUIPMENT COMPANY
Rockford, Illinois
120 S. Pierpont Phone 4-4706

FOR SALE

1—16" Dredge.

1—24" Dredge.

1—20" Diesel Dredge plain suction. Steel Hull.

1—12" Dredge pump direct connected to a 300 H.P. Motor.

1—80 K.W.F.M. D.C. Fairbanks Morse Model 41 Generating set.

1—Steel Barge 70x30x7.

H. P. GUION
6050 Riverdale Ave. New York 71, N.Y.
Phone Kingsbridge 9-8245-8246

SAVE—BUY USED EQUIPMENT FROM OWNER

2 yd. Marion Model 471 Diesel-Electric dragline with Ward-Leonard control.
2 yd. Sauerman scraper hoist, bucket and motor.
1 yd. Sullivan slusher hoist and bucket.
Ingersoll-Rand slusher with 5 HP motor.
3 and 10 ton hoists.
3 Page 2½ yd. dragline buckets.
37½ KVA 2300-400/220 volt transformers.
440/220 volt motors 1 to 75 HP.
2300 volt, 125 HP, 1750 RPM motor and starter.
Pulleys, and gears, 5" pipe.

W. F. HUDSON
Mt. Pleasant, Tennessee

FOR SALE

Model 3000-E, 125 H.P. Littleford Kwik-steam generator, complete with electric motor. New tubes, factory reconditioned and guaranteed. Bargain.

BOX O-15, ROCK PRODUCTS
79 W. Monroe St. Chicago 3, Ill.

FOR SALE

Complete sand and gravel operation in the Pacific Northwest including pit and full line of equipment to operate. This includes all crushing equipment. Plant has been in continual operation for 15 years. Ill health reason for selling. Inquire:

BOX O-18, ROCK PRODUCTS
79 W. Monroe St. Chicago 3, Ill.

FOR SALE

Crushing plant and business near Wichita, Kansas. All electric powered by 300 KW portable plant, Model 8-268A, 500 h.p. GM diesel engine direct connected to 375 KVA GE generator; 20x36 jaw crusher with 3 x 8 feeder; 30"x125' conveyor; 24"x50' conveyor; 4x12 triple deck screen; 10 x 24 jaw and 24 x 40 double roll crushers; 30T bin; 30T scales.

Owner desires to do more extensive contract work.

MURRAY LIMESTONE PRODUCTS, Pleasanton, Kansas

ALSO SEE READY-MIXED CONCRETE AND CONCRETE PRODUCTS EQUIPMENT
WHERE TO BUY ADVERTISING IN CONCRETE PRODUCTS SECTION

Reliance Revolv. Screen 36" x 20'
Revolving Screen 42" x 18'
Niagara 30" x 12' Single Deck Encl.
Robins Vibrex 42" x 60" 2 Deck
Cedar Rapids D.D. Screen 3 x 10
Deister Plato D.D. Screen 4 x 6
Hummer Type 31 D.D. Screen 6 x 5
American #13SA Hammermill
Climax Jaw Crusher 10 x 20
Reliance Jaw Crusher 9" x 16"
Dodge Lever Type Jaw Crusher 9 x 15"
Acme Road Mach. Jaw Crusher 10 x 18"
Cedar Rapids Overhead Ecc Jaw 15 x 36"
5—5' and 6' Pebble Mills
40" x 21' Rotary Dryer, antifriction complete with hoods, etc.
36" x 25' Dryer, new shell
5' x 40' Dryer, new shell
7' x 70' Rotary Cooler
15 Ton Stiffleg, 110' Boom
4—Easton Dump Cars 24" Ga. 1½ yd.
42" x 12' Air Tank ½" shell
Encl. Screw Conveyor 50' x 16"
Encl. Screw Conveyor 45' x 16"
Encl. Screw Conveyor 84' x 12"
Apron Feeder 18" x 11'
Apron Feeder 18" x 5½'
All Sizes Conveyor Belt in stock
Most sizes Transmission Belt
Approx. 250 V-Belt Sheaves
69—36" Trough Idlers 5 roll type
58—30" Trough Idlers Misc. Types
106—42" Trough Idlers, antifriction
135—48" Trough Idlers, antifriction
Reducers ½ H.P. to 50 H.P.
Rotary Feeder Valves ½ to 1½ cu. ft.
Dings Crockett Magnetic Separator
Barber-Greene 12" Bucket Loader

G. A. UNVERZAGT & SONS INC.
136 Colt St. Irvington 11, N.J.

FOR SALE

Twin Cessna Demonstractor Model 310, many extras. New engines, full instrument, excellent condition. Collins radio equipment throughout. Would share ownership, in Great Lakes area.

Two 1953 Austin-Western Patrol Graders, one model 88H, one model 99H, excellent condition.
Two heavy duty tanks, 19'-6" long, 6'-6" diameter, 4500 gallon capacity, pressure or suitable for liquid chloride.

BOX O-14, ROCK PRODUCTS
79 W. Monroe St. Chicago 3, Ill.

4' Symons Std.
1600 hp Fairbanks Morse marine engine—Wemco #3. Mobil Mill—6x7 feeders—6x3½ grizzlies—#20 Williams Slugger hammermill—1300 cfm. Ingersoll Rand PRE-2 compressor—30 ton outside. Overhead traveling crane-American Revolver model. Rib—20" dredge pump—Ottumwa hoists 100, 150, 165 hp—7 x 110 kilns—6x74 coolers.
JAW CRUSHERS 8466, 3042, 2450, 2436, 2036—**GYRATORY** 16", 20", 30" 36" Sup. McCully—12K Gates—Austin #7½—Telsmith #32—4' Traylor TS double reduction—3' 4" Traylor multi-stage reduction—**MILLS** Allis Chalmers compeb 6' x 22'—5 x 10, 5 x 14, 8 x 12 rod—5½ x 22 tube—10' x 48" Hardinge conical—**ROLLS** 2416, 3018, 4022—**PLANTS** Cedar Rapids Jr. washing, Cedar Rapids Jr. Tandem, Pioneer 24 special, Cedar Rapids AAAA, 3042 primary, 2025 C. R. primary—**LOCOMOTIVES** 20, 44, 65, 80, tons—85 ton trolley locomotive—**SHOVELS-DRAGS** P & H 855, 955, 1055, —N.W. 6, 8, 41, 80D, 95—Lorain 820—B.E. 120B—Marion 111 M—Manitowoc 3500 & 4500—Monighan 9W—Link Belt K-505—Koehring 304 & 605. Many other items.

STANLEY B. TROYER EQUIPMENT COMPANY
Box 97 Phone 508 Crosby, Minn.

Rotary Drill Supplies in Stock at Columbus, Ohio. Subs, Spiral Reamers, Drill Pipe and Rotary Bits.

THE WHITE ORR CO.
766 Northwest Blvd. Columbus 8, Ohio

SHOVELS—DRAGLINES—DRILLS TRACTORS—TRUCKS

170-B Bucyrus-Erie Electric 6½ yd. shovel
1600 P&H 6 yd. electric shovel
2400 Lima 6 yd. diesel shovel
2400 Lima 4 yd. Hi-Lift shovel
120-B Bucyrus-Erie electric 5 yd. shovel
1400 P & H 4 yd. electric shovel
111-M Marion 3½ yd. diesel shovel
4161 Marion 5 yd. electric shovel Worked about three years.
1201 Lima 3½ yd. diesel shovel
955 P&H 2½ yd. diesel shovel
1201 Lima Hi-Lift diesel shovel 42' boom, 32' stick, 2½ yd. dipper.
1201 Lima Semi-Hi-Lift diesel shovel, 36' boom, 27' stick, 2 yd. dipper
3500 Manitowoc Hi-Lift diesel shovel, 45' boom, 35' stick, 2 yd. dipper
111-M Marion Hi-Lift diesel shovel, 43' boom, 23' stick, 3 yd. dipper
40-A Marion Hi-Lift diesel shovel, 45' boom, 34' stick, 2½ yd. dipper
9-W B-E Electric Dragline 200' boom, 8 yd.
7400 Marion Electric Dragline 200' boom, 8 yd.
625 Page diesel dragline 150' boom, 9 yd. bucket
5-W Bucyrus-Erie diesel dragline 125' boom, 5 yd. bucket
2400 Lima diesel dragline 130' boom, 5 yd. bucket
4500 Manitowoc diesel dragline 120' boom, 5 yd. bucket
B-E 120B Electric dragline 110' boom, 4 yd. bucket
4161 Marion dragline 110' boom, 5 yd. bucket
111-M Marion diesel dragline 80' boom, 4 yd. bucket
1055 P&H diesel dragline 80' boom, 4 yd. bucket
1201 Lima diesel dragline 85' boom, 3 yd. bucket. Independent boom hoist.
3500 Manitowoc diesel dragline 85' boom, 2½ yd. bucket
600 Reich Heavy truck mounted rotary drill
Quarrymaster Drill with 2—500 cu. ft. compressors
58-BH Joy Champion Rotary Air Drill
56-BH Joy Middleweight Rotary Air Drill

Also
42-T, 29-T, and 27-T Well Drills
Euclid Trucks — Many to Choose From

FRANK SWABB EQUIPMENT CO., INC.
313 Hazelton Nat'l Bank Bldg.
Hazelton, Pa. GLadstone 5-3658

FOR SALE

4 10" McCully Gyratory Crushers
3 Traylor No. 412 Type TZ Gyratory Crushers
2 Traylor 8" Gyratory Crushers
1 New RCA Metal Detector 10" x 36" aperture
6 Used single deck Robins Gyrex Screens with boxes
5 Used single deck Robins Vibrex Screens
1 Used Cameron pump, size 10", 2400 G.P.M., 125" head, 1150 R.P.M., Left Hand, Serial No. 57537
1 Used Cameron pump, size 10", 2400 G.P.M., 125" head, 1150 R.P.M., Right Hand, Serial No. 57535
1 New Edison Voice Writer (Dictaphone)

Apply to:

NEW YORK TRAP ROCK CORP.
230 Park Avenue
New York 17, New York

SHOVELS — CRANES — DRAGLINES

Bay City 65 Shovel-Backhoe-Crane, 1¼ yd. Diesel.
N-W 90-D 2½ yd. Dragline, Diesel, 100' boom.
N-W Model 6, 1¼ yd. Diesel Shovel.
Northwest 80-D Diesel Shovel 2½ yd. New 1952.
Lorain L-820 3-yd. Shovel-Drag-Crane 100' bm.
Lima 1201, 2½ yd. Diesel Shovel.
Manitowoc 3500, 2½ yd. High Lift Shovel.
Buc-Erie 54-B Diesel Shovel, 2½ yd.
Manitowoc 3500 Dragline, 140' boom, new 1950.
Northwest 35 Diesel, ¾ yd. Shovel.
Lima 604 Backhoe-Crane-Drag. Cat. D13000 Diesel.
Lima 604 Drag. Diesel, 65' bm; New 1954.
N-W 95, Drag. New 1951. Murphy Diesel 80' bm.
N-W 6, Crane-Drag. New 1951. Murphy Diesel
Koehring 605 Shovel-Crane-Dragline Cat. D13000

CRUSHERS

JAW: Acme 10x30, 14x28, 14x36, 10x45, 16x32, 18x32, 25x40. Eagle 20x36. Diamond 24x36". Cedar Rapids 10x30, 20x36, 25x40. Farrell 10x30, 12x30, 14x36, 18x36, 36x48. Buchanan 36x42. Good Roads ReHance 15x30. Traylor 10x26, 24x36. Allis-Chalmers 30x18. Good Roads 10x30. Telsmith 18x32. Traylor 48x60, 42x48. Allis Chalmers 42x40
GYRATORY: Al-Chal 322, 6", 7½", 8, 9, 9K, 10, 20, 30 and 36" Telsmith 8B, 28" Intercone, 36" Gyrasphere; Kennedy Van Saun 7, 19, 25½-S, 37½, 38; Traylor TY 1'8", 36", 4' Type TS.
ROLL: Cedar Rapids 40x20. Pioneer 40x22. Pioneer 30x18. Telsmith 24x16. Pioneer 30"x18". New Holland 24x16. Pioneer triple 40"x22" A-C 42"x16".
HAMMERMILL: Size 4 Williams Jumbo. Pennsylvania 8X2, 27x22. Cedar Rapids 20x33. Jeffrey 36x42, 36x24, 36x40. Penn 8XR-100. Cedar Rapids 30x33.
BALL MILL: Hardinge 10'x48". K.V.S. 6'x8' Type M Air Swept J-H 6'x6'. Hardinge Conical 6'x22". Colorado Iron Works 5'x8'; Marcy No. 64½. Hardinge conical 10'x36"
ROD MILL: Jackson & Church 4'x10' 10 ton rods, new. Marcy 3x8, 5x12, 6x12.
AUTOCLAVES: Jackson & Church bolted head 50'x6' "Quick Acting" head 50' x 6'6".
CONE: Symons 2' and 3' coarse bowl.
KILNS: 4'x42', 5'x30', 6'x50'6", 6'4"x45', 7'x110' 10'6"x105'.
DRIERS: Vulcan 4½x50', others 7'x30', 6'x80', 7'x70', 6'x40' and Cedar Rapids 60"x24'.

CRUSHING PLANTS

Cedar Rapids "Pitmaster" port. washing-screening.
Cedar Rapids Portable Super Tandem, excellent.
Austin Western port. Model 101. New 1952.
Pioneer 305W, crushing, washing, screening.
Cedar Rapids 40x23 Port. Secondary, Diesel.
Universal Model 880 Port. Gravel Plant.
Pioneer Port. 11x36 jaw, 40x20 rolls.
Telsmith Sand-Gravel-Screening, large capacity.
Cedar Rapids 4033 hammermill, complete, excellent.
Diamond 66, Port. Prim. 1036. Secondary 3018.

CLASSIFIERS

Conveyco 4'x10' sand-dewatering pump and motor.
Dorr 5'x20' Rake type.
Dorr 6'x27' Duplex Rake type.

CONCRETE PLANTS AND EQUIPMENT

Johnson concrete plant 333 yds. 5 aggr. compt.
Cement silos, Corps of Engr. Spec.
Johnson concrete plant 300 yds. Corps Engr. Spec.
5 aggr. compts. cement silo 2706 bbls.
Erie Strayer Port. Complete 30-40 yds. hr.
Johnson 200 yd. 4 aggr. compt. 200 bbl. cement compt. 1082 bbl. silo.
B-K 400 bbl. cement bin, 400 bbl. silo.
Heltzel 100 ton 3 compartment aggr. bin.
Butler 212 cu. yd. 6 compts. Complete.
Smith 56-S 2 yd. tilting mixer. 30 HP elec. motor.
B-K 4 compartment aggr. bin 180 tons cement bin. 400 bbl. high 400 bbl. ground silo.

SAND AND GRAVEL HYDRAULIC DREDGES

10" Portable Diesel powered. Complete.
12" Diesel powered, pontoon mounted. Complete.
Ellicott 8" with cutter. Diesel Hull 48'x18'x3'6".
8" Hydraulic. Diesel. On 32'x8' steel pontoons.
Ameco 10" Diesel power portable. Excellent.
6" portable Diesel complete with cutters, etc.
8" H-P twin Diesel drive. Complete.

DERRICKS

American 20 ton Guy Derrick 100' boom, 116' mast.
American Terry 20 ton Guy Derrick, 100' boom.
Guy Derrick, 15 tons, 115' mast, 105' boom.
American 25 ton stiff leg derrick, 90' boom.
Special 35 ton stiff leg derrick, 100' boom.
Nat'l Bridge 30 ton Guy Derrick, 100'.
American 30 ton stiff leg, 100' boom.

SCREENS

Diamond Model DIW3 3 deck 4'x12'.
Robbins Gyrex 5'x16' double deck.
Tyler Model F-360 (300) 4'x12' double deck.
Simplicity 4'x10' four deck.
Symons 4'x14' double deck.
Tyler 4'x10' two deck heavy duty, motor, Gen. Set.
Telsmith 5'x12' dbl. deck elec. motor.
Cedar Rapids 4'x12' dbl. deck elec. motor.
Pioneer 4'x12' 2½ deck elec. motor

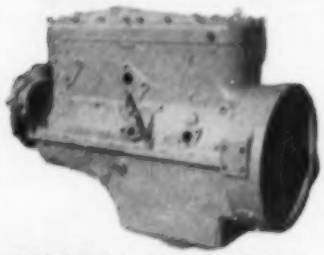
RICHARD P. WALSH CO.
30 Church St. New York, N. Y
Cortland 7-0723 Cable: RICHWALSH

ASPHALT PLANT NEW 1954

Cedarapids Model CM, 40 T.P.H. continuous mixer with cold bins, feeders, drier, dust collector, gradation unit, boiler, storage tanks and piping. Serial 15638. Has produced only 30,000 tons. Available now.

Phone or Wire

CONTRACTORS MACHINERY COMPANY
P.O. Box 6128 San Antonio, Texas
Phone WAlnut 3-4528



HERCULES JXD ENGINES
U.S. Surplus — $245.00

Unconditionally guaranteed
Complete — Less Accessories

FORBES MOTOR COMPANY
Rt. # 22 (Pgh) Monroeville, Pa.
Phone VA-4-0100

SURPLUS EQUIPMENT

Available throughout the U.S. — Items you need may be available near you. Your inquiries would be appreciated.

Buildings	Derricks	Loaders	Pavers
Bins	Draglines	Locomo-	Rollers
Barges	Ditchers	tives	Rail
Buckets	Dredges	Mixers	Scales
Belting	Drills	Motors	Screens
Cableways	Engines	Mills	Stacklines
Cars	Excavators	Machine-	Shovels
Compres-	Feeders	tools	Tanks
sors	Graders	Pulverizers	Tractors
Conveyors	Generators	Pipe	Trailers
Crushers	Hoists	Pumps	Etc., Etc.
Dryers	Kilns		

(I can sell your surplus equipment)

ALEX T. McLEOD
MARIETTA, KANSAS

CRUSHERS
40x48 Buchanan Jaw new condition with 48"x16" Telsmith Feeder.
30"x36" Traylor Blake Model M.
24"x36" Allis Chalmers Worthington, Rebuilt.
18"x36" Austin West. Top Ecc. with Feeder and Motor.
13x24, 12x30, & 18"x36" Farrel Blake Jaw.
9½"x15" Dodge Lever Type Jaw, Rebuilt.
37½ Kennedy, 550 Volts Connected.
38½ Kennedy Belted Gyratory.
36"—20" & 10" Allis Chal. Superior McCulley.
#9—7½—6—5—4K Allis Chalmers Gyratory.

LOCOMOTIVES & CRANES
15 Ton Diesel 60' Boom Whirley Crane.
3—65 & 44 Ton G.E. Diesel Elec. Locomotives.
10 Ton Plymouth Diesel Locomotive.
100, 35 & 25 Ton G.E. Diesel Elec. Locomotive.
25 Ton Amer. Diesel Loco. Crane. 50' Boom.

REDUCTION MILLS
12 Rod Mills 30" x 54", 4' x 14', 5' x 10', & 6' x 12' Denver, Marcy & A.C.
45 Ball Mills: 3x4', 3x7', 4x5', 5x8', 5x10', 5x18', 6x5', 6x8', 6x10', 6x9', 7x5', 7x6', 7x7', & 3 Marcy 8ft.
29—Hardinge Mills: 10'x48", 8'x18", 8'x36", 8'x22", 7'x36", 6'x36", 6'x22", 6'x14", 5'x36", 5'x24".

ROTARY KILNS
19—4'x28', 6'x28', 7'x110' & 9'x125'.

ROTARY DRYERS
3'x28', 4'x20', 5'x35'. Single Shell.

AIR COMPRESSERS
410 CFM Inger. Rand 90B—100HP—440V.
1578 Inger. Rand PRE2—4100 2300 V.
2—2874 Inger. Rand PRE2—478 HP. 2300 V.

R. C. STANHOPE, INC.
60 E. 42nd St. New York 17, N.Y.

54" x 70" Bird solid bowl CENTRIFUGE.
CRUSHING PLANTS: Rogers 120 TPH; Pioneer 40V, CR 2 unit, 200W, Diamond 95.
CRUSHERS: 9x30 Telsmith, 1020 Allis, 1036 CR, 1218 Acme, 1536 Pioneer, 1836 & 2036 CR, 2436 Lippman, & 3042 Buchanan JAW. 1' 8" & 2' 4" Traylor. 10, 16, 26, 30 & 36" McCully. 16B Telsmith GYR. 2, 3, & 4' CONE. 4022 AW DBL ROLL.
MILLS: 4x8, 6x22, 6x8 & 6x12 Ball. 5x14 Rod. CR #4, Jeffrey 2420, Williams 4, 5 & 20 Hammer.
DRYERS: 4x30, 5x30, 5x40, 6x50, 7x110, 8x125 & 10x120.
855 CFM Sullivan MD AIR COMPRESSOR.
SHOVELS & DRAG: Insley K12, Koehring 1055, Lima 604, 802, 1201, Bucyrus 120B, 170B, NW6, 35, 80D, & 95. P&H 255, 1055. Marion 40A, 92, 97M, 302, 450, 480 & 490. Lorain 520.
Equip. here: 100 ton Bin, 2432" Ball Mill, OC3 Loaders 10 ton Lorain TL20 MotoCrane.

MID-CONTINENT EQUIPMENT CO., INC.
8321 Gannon Ave. St. Louis 24, Mo.
Wydown 1-2826

3500 MANITOWOC ERECTION

CRANE

Diesel—120' boom, 30' jib

This machine just like new.

FRANK SWABB
EQUIPMENT CO., INC.
313 Hazelton Nat'l Bank Bldg.
Hazelton, Pa. Gladstone 5-3658

JAW CRUSHERS

60"x48" to 6"x3"

New and used RELIABLE

"Farrel-Bacon"
Jaw Crushers

BACON-PIETSCH CO., INC.
26 Park St., Montclair, N. J.
29 Washington Ave., Hamden, Conn.

WANTED

JAW CRUSHER

48" x 60"

or larger or smaller

PRODUCERS SUPPLY
& ENGINEERING CO.
4200 S. Lawndale Ave. Lyons, Ill.
Phone: Lyons 3-4526

FOR SALE or RENT

35 ton Davenport Gas Locomotive 1942.
50 ton Whitcomb Diesel-Elec Locomotive.
140 HP Christian 2D Diesel Hoist & Swing.
10 ton Unit #1020 Mobile Motor Crane.
25 ton Ohio Diesel Loco Crane 1947.
25 ton American Steel Guy Derrick.
30 ton Steel Stiffleg Derrick & Hoist.
100 HP Lucey Portable Firebox Boilers.
2½ yd. Manitowoc 3500 Diesel Crane 1948.
3½ yd. Lima 1201 Shovel-Dragline.
5 yd. P&H 1400 Diesel Shovel 1950.
2200 CFM C-P OCE Air Compr. 350 HP.

Mississippi Valley Equipment Co.
513 Locust St. St. Louis 1, Mo.

FOR SALE

Jeffrey 24" x 28" Hammermill, purchased 1949. Type 3B. Excellent condition. Used only as standby unit, now surplus. Price: $1350.00 F.O.B. Denver.

The Robinson Brick & Tile Co.
500 S. Santa Fe Drive Denver 23, Colo.
Phone: Sherman 4-3371

MOTORS AND GENERATORS

All sizes, new and rebuilt. Starters, accessories, pulleys and repair parts. Gear motors, Falk Shaft mounted Speed Reducers, couplings and V-belt drives.

Expert Repair Service

NUSSBAUM ELECTRIC COMPANY
220 E. Douglas Ave., Fort Wayne, Ind.

FOUNDATION TESTING, CHEMICAL ANALYSIS

CORE DRILLING

THOMASVILLE DRILLING & TESTING CO.
THOMASVILLE, PENNA.

HELP WANTED

Superintendent for limestone operation in midwestern state doing 150,000 tons annually. Must have knowledge of quarry operation, crushing, pulverizing, screening, drying and packing. State qualifications and salary expected.

BOX O-16, ROCK PRODUCTS
97 W. Monroe St. Chicago 3, Ill.

COMPLETE CRUSHING PLANT

Including 50" Superior-McCully Gyratory Crusher; 3' & 4' Symons Cone Crushers; 5'x12' and 4' x 14' Vibrating Screens; 50' x 150' and 24" x 90' & 75' Conveyors; 375 KVA Generator; two D-17000 & one D-13000 Diesel Power Units, Motors. For sale as unit.

ALEX T. McLEOD
Marietta, Kansas

WANTED: MAINTENANCE SUPERINTENDENT

Must be familiar with diesel engines, shovels, tractors, crushing and screening equipment, etc. To head maintenance program of Stone Quarrying and Crushing operation. Location: Mid-East. Salary plus Bonus. Please state salary required, experience, when available. First reply.

BOX O-10, ROCK PRODUCTS, 79 W. Monroe St., Chicago 3, Ill.

New — RAILS — Relaying

All sections available together with all accessories. Also interested in purchasing surplus equipment you may have available.

M. K. FRANK
480 Lexington Ave., New York, New York
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Park Bldg. Pittsburgh, Pa.
Carnegie, Pa.

Quarries
Crushing Plants
Cement Plants
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CONSULTING ENGINEERS

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Operation
Plant Layout
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Markets are not merely people, but people who *buy*.

Advertise your used equipment in ROCK PRODUCTS

ALSO SEE READY-MIXED CONCRETE AND CONCRETE PRODUCTS EQUIPMENT
WHERE TO BUY ADVERTISING IN CONCRETE PRODUCTS SECTION

PROJECT ENGINEER WANTED

Graduate Mining, Metallurgical, Chemical or Mechanical Engineer, preferably 25 to 35 years old, wanted by medium size progressive heavy machinery manufacturing company, located in South eastern Pennsylvania. To assist in design and preparing for market of various lines of equipment used in mineral dressing, heavy chemical, cement and rock products industries. Must have had engineering and field experience, and be willing to work on drafting board, travel and to do field service. Opportunity also exists for a properly qualified individual, eventually to become sales engineer. Salary open.

BOX N-65, ROCK PRODUCTS, 79 W. Monroe St., Chicago 3, Ill.

WANTED

Diesel Power unit complete. Approx. 150 H.P., 3 drum hoist approx. 3000 lbs. 30 ft. of 8¾ I.D. Sand Suction and discharge hose.

WANT 8" sand pump.

NORM SCHAEFER

62 Copeland Ave. La Crosse, Wisc.

EVANS & ASSOCIATES

CONSULTING ENGINEERS

Box 334

Annville 1, Pa.

A complete service for the lime, crushed stone and associated industries.

WANTED

42" GYRATORY CRUSHER

The National Lime & Stone Co.

Findlay, Ohio

WANTED

KILN OR COOLER

8' x 80'

OR LARGER

PRODUCERS SUPPLY & ENGINEERING CO.

4200 S. Lawndale Avenue

Lyons, Ill. Phone: Lyons 3-4526

WANTED

2½ to 4 Yard Sauerman Cableway Excavator, Mast and Hoist

LONG CONSTRUCTION CO.

Box 1875 Billings, Mont.

POSITION WANTED—Administration in operation or engineering. 17 years experience in the industrial minerals field, of which 10 years were in the Portland Cement Industry. Engineering Graduate, late thirties, now employed. Salary Open. BOX N-61, ROCK PRODUCTS, 79 W. Monroe St., Chicago 3, Ill.

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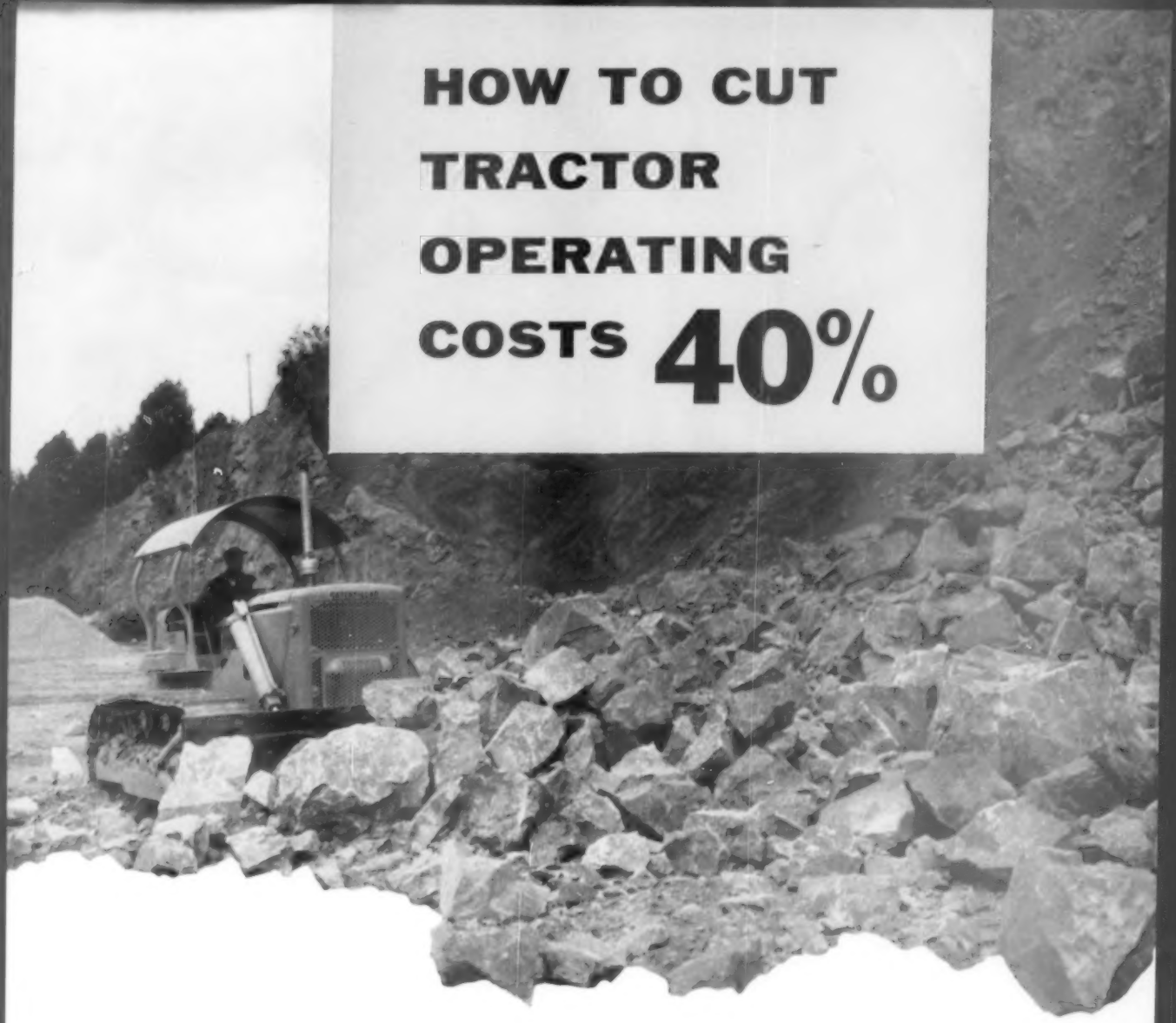

THIS new Caterpillar D7 Tractor (Series C) replaces another D7, veteran of 14 years of tractor-busting work in the quarry of Olympic Portland Cement Co. at Limestone, Wash. The old D7 it replaces cost a total of $29,669.31 for all running expenses, upkeep and repair during 14 years on the job. This is three times its original cost. According to Joe Ristine, Quarry Superintendent, the usual figure in this rough work is five times original cost. A clear saving in this case of 40%!

With its No. 7A Bulldozer, Olympic's new D7 clears shot rock from the quarry floor, cleans up around the shovel, and maintains haul roads. Rugged work—but this new CAT* Diesel Tractor is designed to handle even *more* jobs at even *lower* cost than its sturdy predecessor. Its heavy-duty diesel engine develops 128 HP for bigger, more profitable loads. The injection system delivers full, foul-free power on money-saving No. 2 furnace oil.

This new tractor is available with an oil clutch for longer life and greatly increased periods between clutch adjustments. Track shoes are now hardened by a new "water quench" process to stand up under severe quarrying conditions. Hydraulically boosted steering and new starting engine with easy single-lever control are popular with operators.

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Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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Plant	Average service Kaiser Brick	Average service 70% alumina Brick	EXTRA SERVICE with Kaiser Brick
1	14 months	1 month	13 months
2	24 months	12 months	12 months
3	15 months	3 months	12 months
4	15 months	4 months	11 months
5	14 months	3 months	11 months
6	14 months	3 months	11 months
7	12 months	4 months	8 months
8	15 months	7 months	8 months
9	7 months	1 month	6 months
10	12 months	6 months	6 months
			Average: 9.9 months EXTRA SERVICE

Call or write Kaiser Chemicals Division, *Kaiser Aluminum & Chemical Sales, Inc. Regional Sales Offices: 1924 Broadway,* OAKLAND *12, California... Three Gateway Center,* PITTSBURGH, *Pa.... 518 Calumet Bldg., 5231 Hohman Avenue, Hammond,* Indiana (CHICAGO).

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